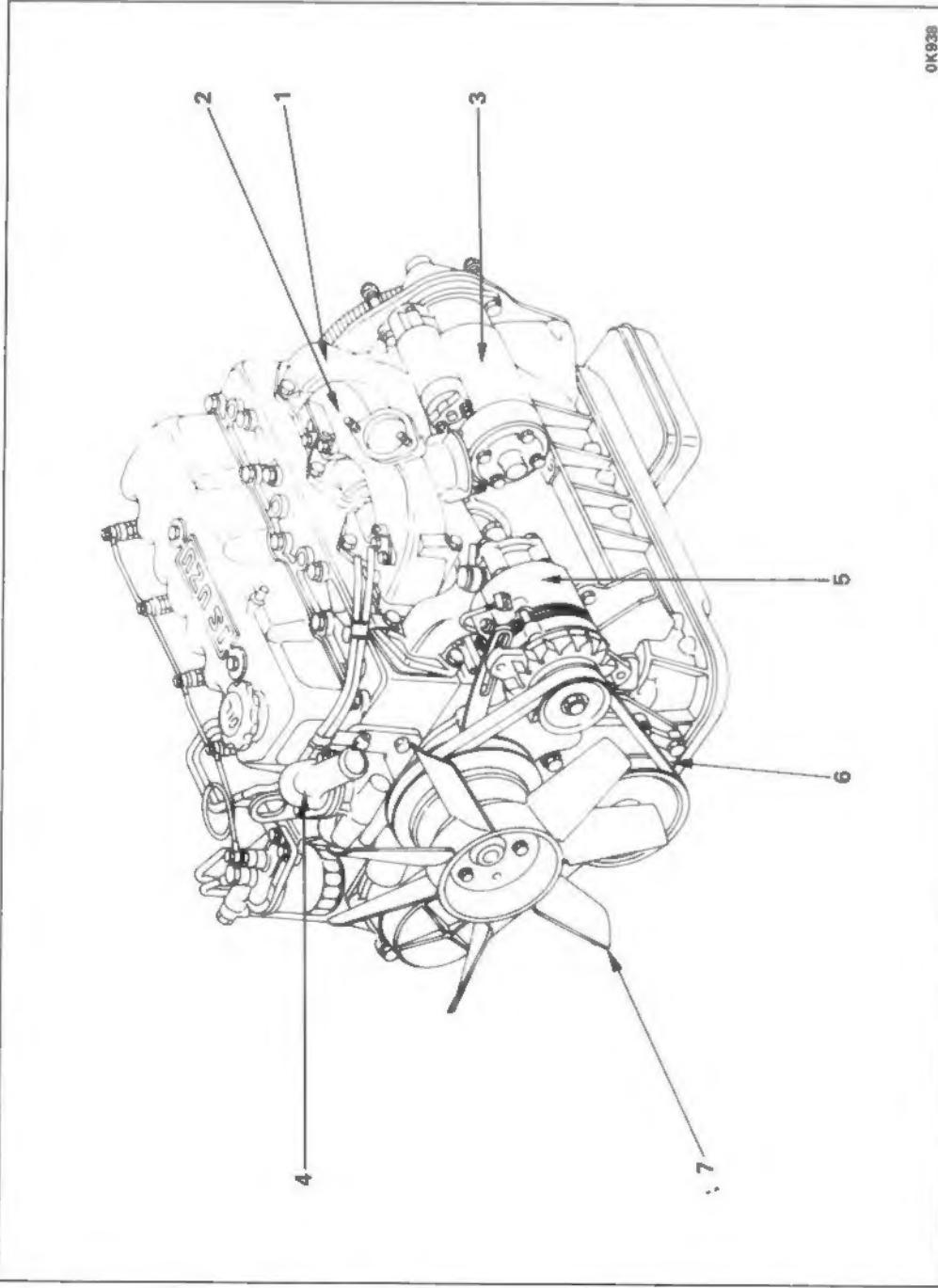


## EXTERNAL PARTS (Left hand side)

This illustration is based on the C190 and C240 models.



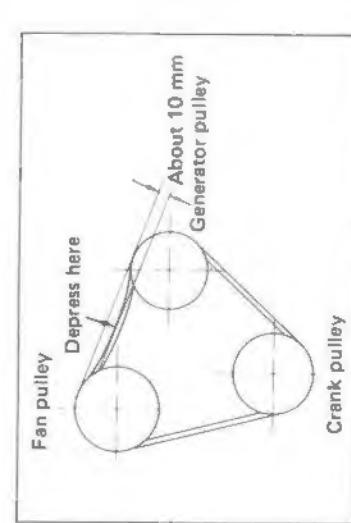
## Reassembly steps

1. Exhaust manifold
2. Intake manifold
3. Starter motor
4. Thermostat housing
5. Generator assembly
6. Fan belt
7. Cooling fan and spacer

## Important operation

6. Fan belt  
Specified belt deflection

Fan belt (mm)	10
---------------	----



## SECTION 3

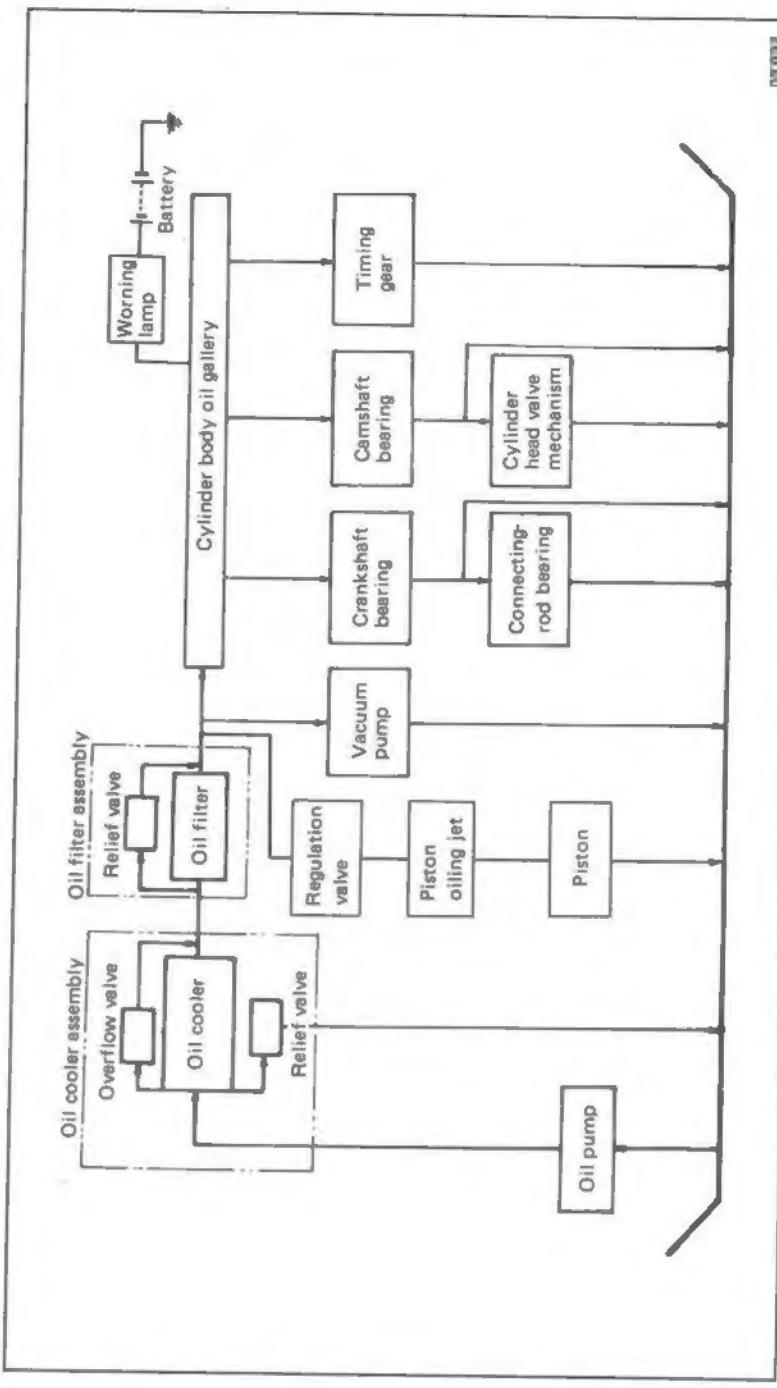
## LUBRICATING SYSTEM

## INDEX

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With oil cooler type	3-8
Oil cooler	3-10
Oil jet pipe and relief valve	3-10

## GENERAL DESCRIPTION



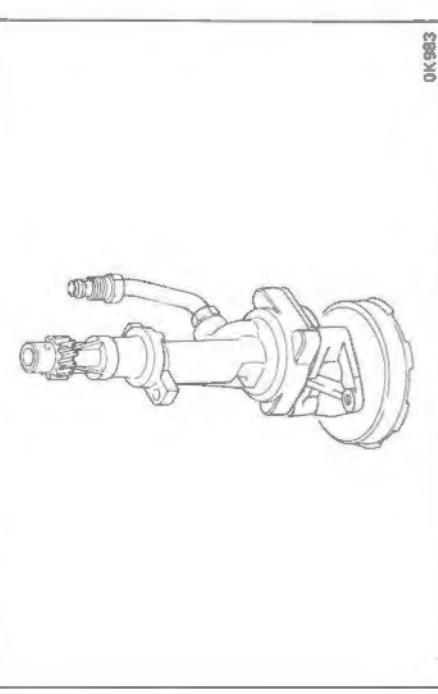
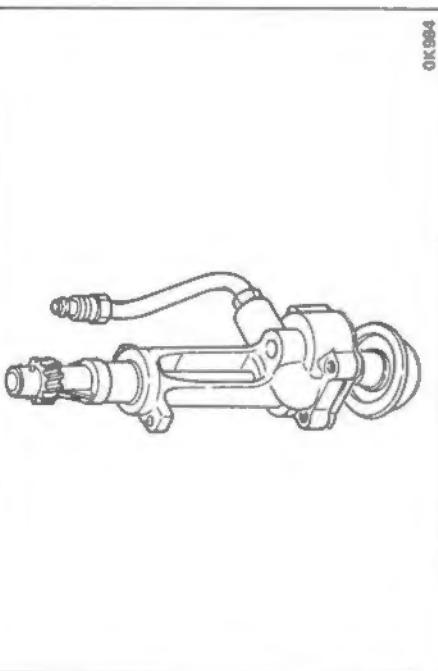
## PAGE

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With oil cooler type	3-8
Oil cooler	3-10
Oil jet pipe and relief valve	3-10

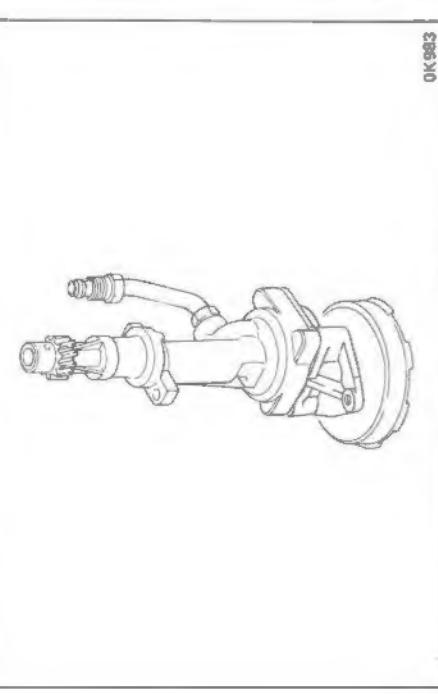
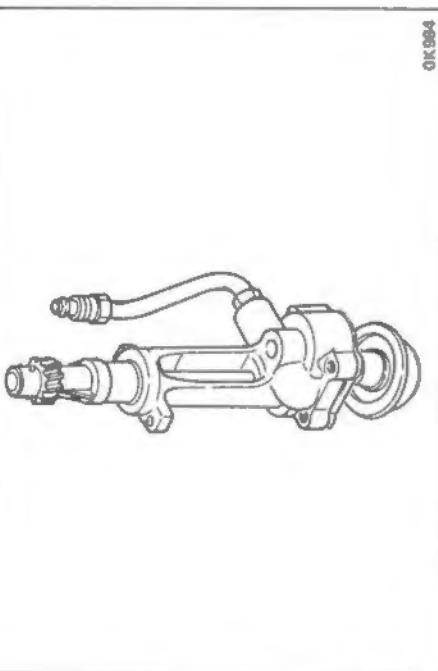
## OIL PUMP

This illustration is based on rotor type

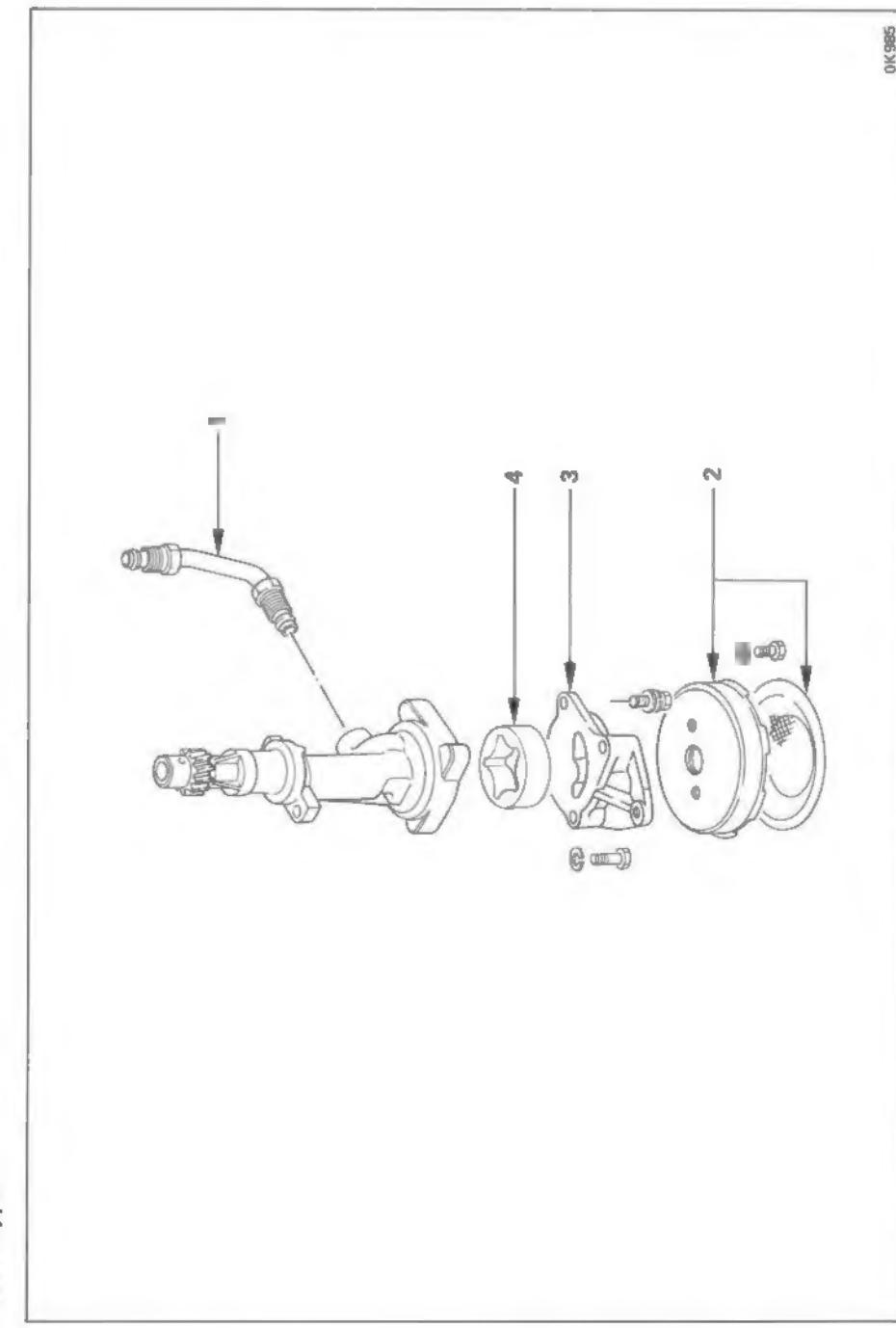
This illustration is based on gear type



This illustration is based on gear type


 DISASSEMBLY

Rotor type

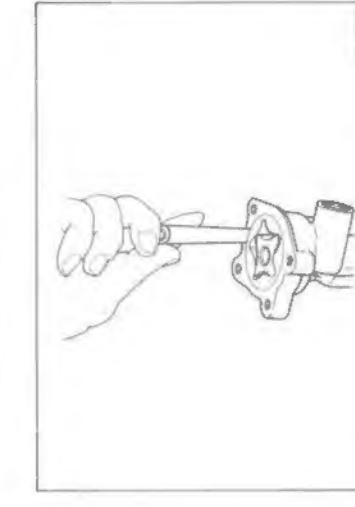
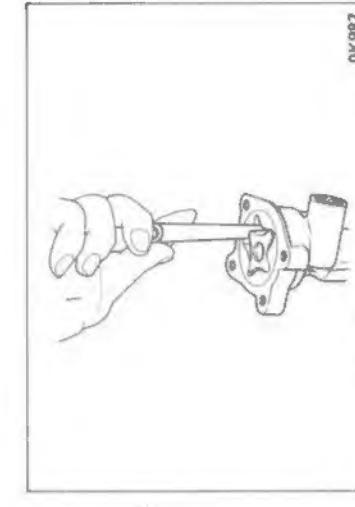
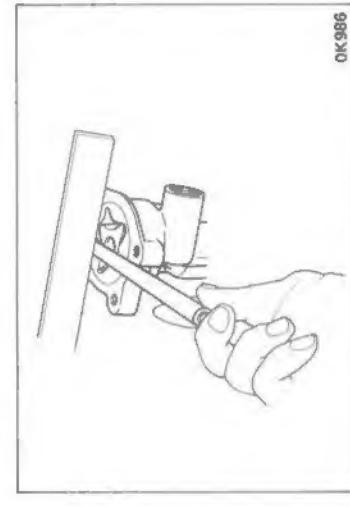


## Disassembly steps

1. Oil pipe
2. Strainer
3. Pump cover
4. Vane

 INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.



Clearance between vane, and body.		(mm)
Standard	Limit	
0.02 – 0.07	0.15	

Clearance between rotor and vane.		(mm)
Standard	Limit	
0.02 – 0.13	0.15	

Clearance between vane and pump body.		(mm)
Standard	Limit	
	0.2 – 0.27	

Clearance between rotor shaft and pump body.		(mm)
Standard	Limit	
0.04	0.2	

**Pinion replacement**

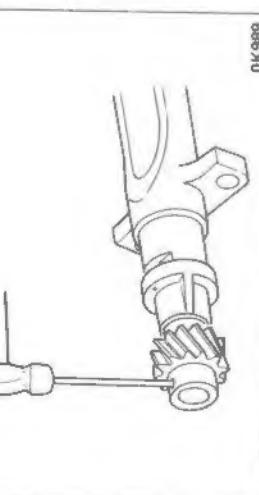
**Removal**  
File off caulked end of the pinion stopper pin, then drive out the pin toward opposite side.



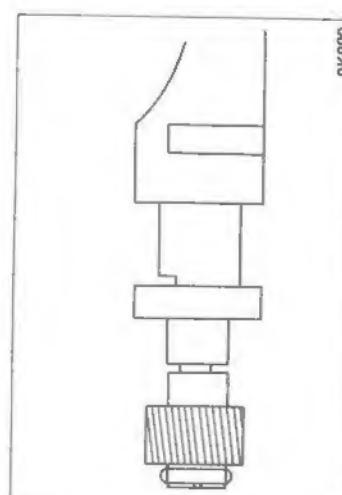
**Installation**  
It is necessary to drill a hole in one side of the pinion for service as it does not have a hole on both sides.



**Installation**  
Install a new stopper pin and caulk end of pin after installation.



0K988



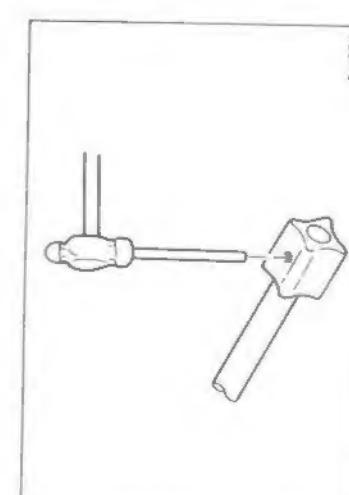
0K990

**Rotor replacement**

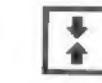
**Removal**  
Drive out the pin from one side.



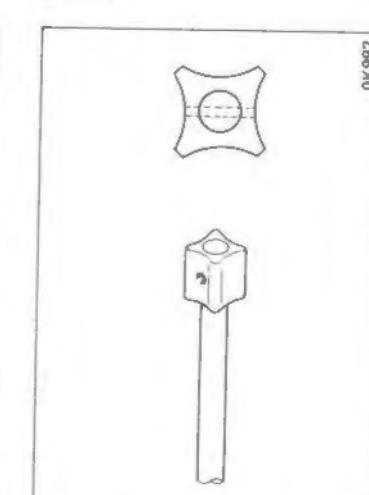
**Installation**  
When the pin is installed, check to make certain end of the pin is not projected from the end of rotor.



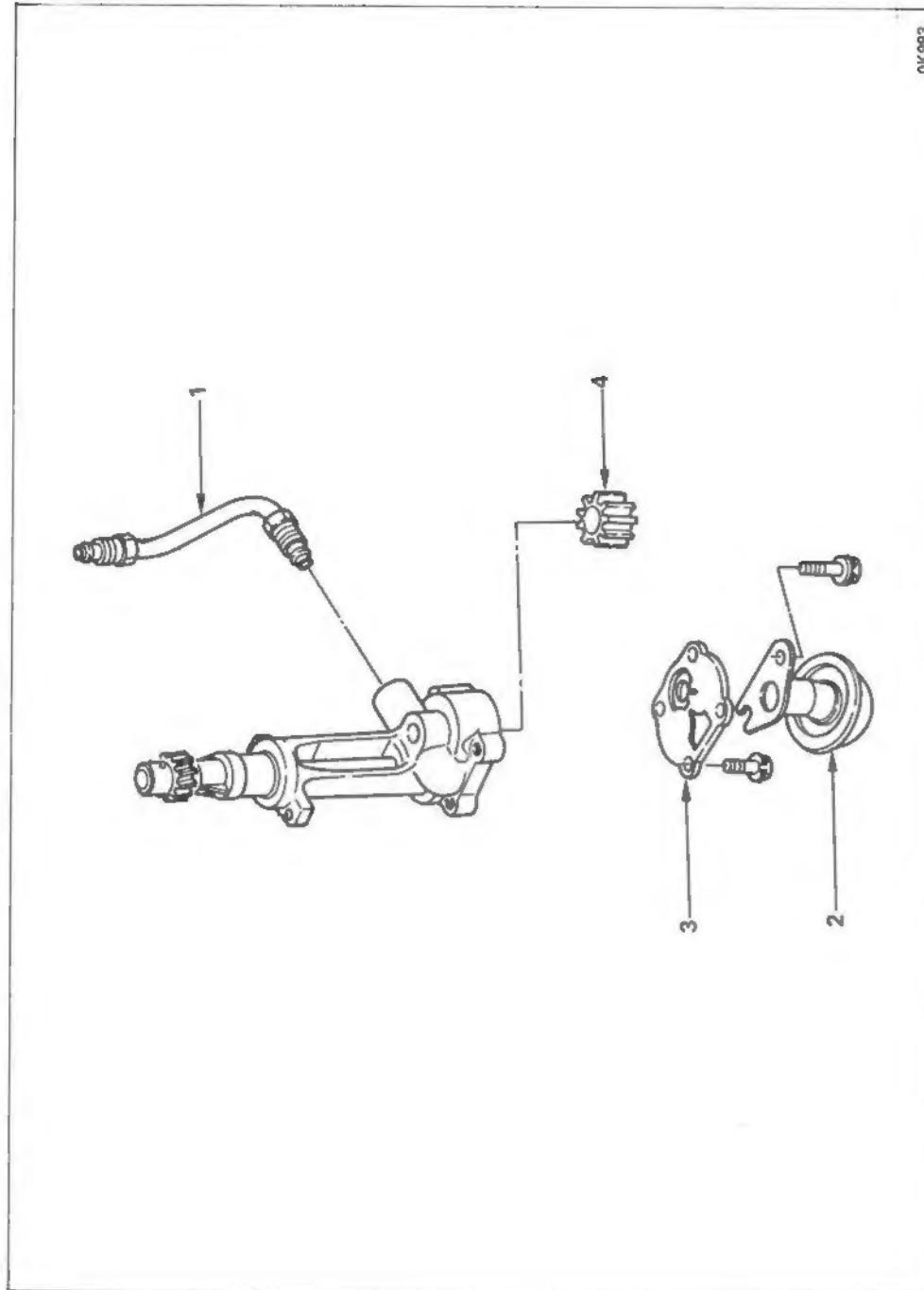
0K991



**Installation**  
When the pin is installed, check to make certain end of the pin is not projected from the end of rotor.



0K992

**DISASSEMBLY****Gear type****Disassembly steps**

3. Cover
4. Driven gear

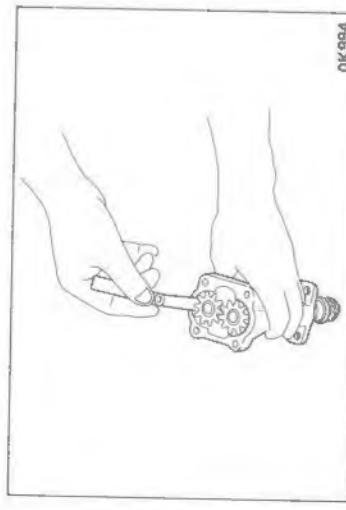
1. Oil pipe
2. Strainer

**REASSEMBLY**

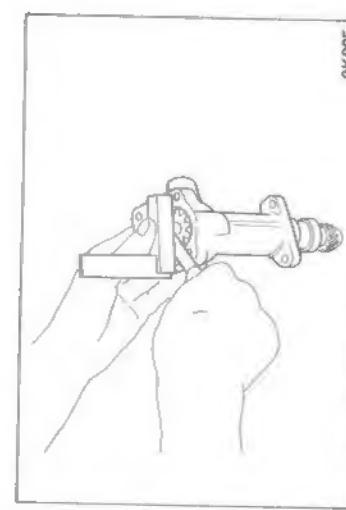
To assemble, follow the disassembly procedure in reverse order.

## INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.



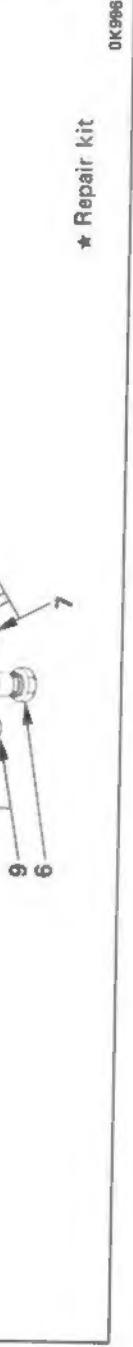
	Standard	Limit	(mm)
Clearance between gear teeth and body inner wall.	0.12 – 0.13	0.15	



	Standard	Limit	(mm)
Clearance between body and gear.	0.04 – 0.09	0.10	

## REASSEMBLY

To assemble, follow the disassembly procedure in reverse order.



## REASSEMBLY

To assemble, follow the disassembly procedure in reverse order.

### Disassembly steps

1. Drain plug
2. Center bolt
3. Cover
4. Spring, seat and gasket
5. Element
6. Relief valve assembly
7. Overflow valve assembly
8. Oil cooler relief valve (Model with oil cooler)
9. Plug and O-ring (Model without oil cooler)

## INSPECTION AND REPAIR

Make necessary correction or parts replacement if damage or any other abnormal conditions are found through inspection.

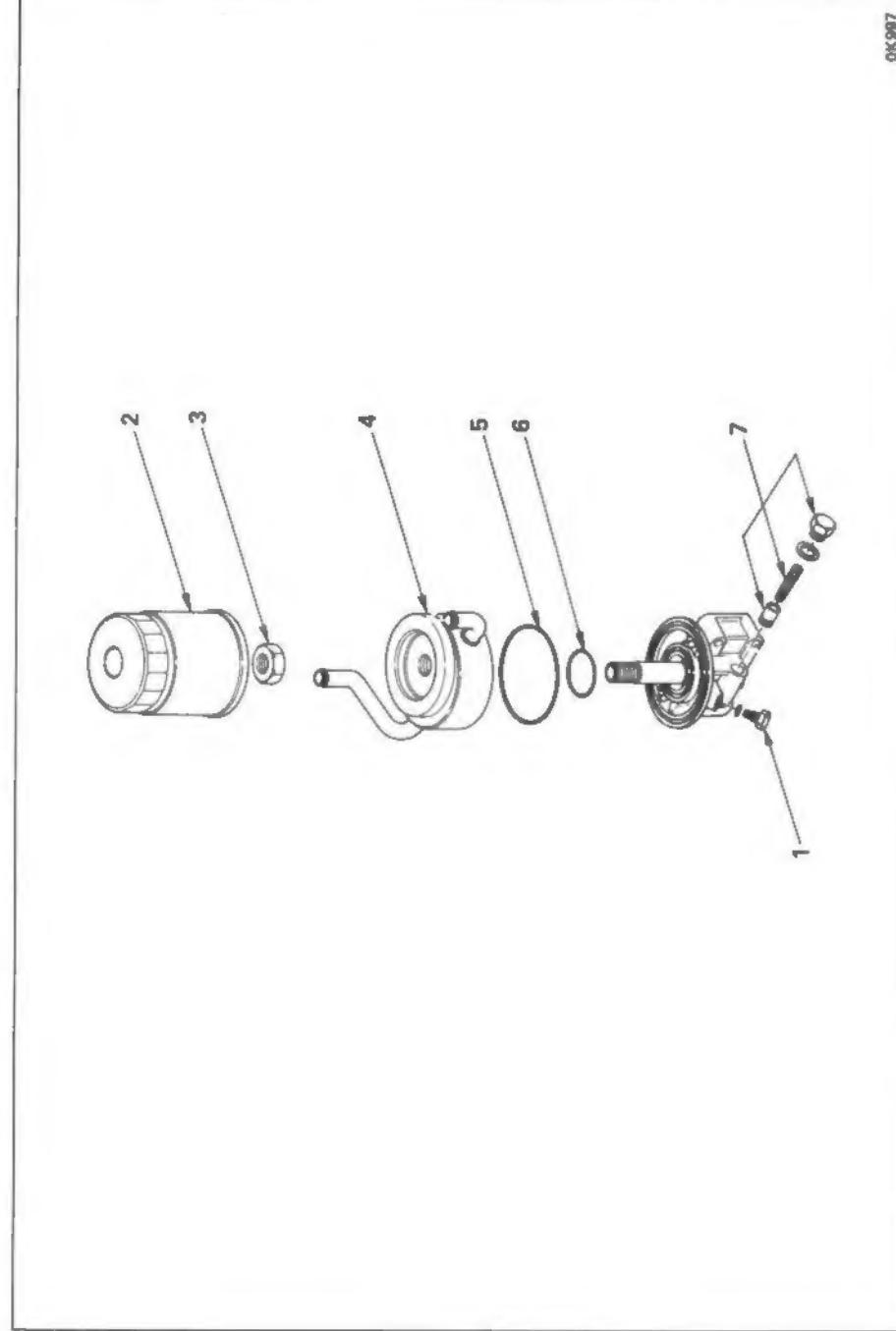
## REASSEMBLY

To assemble, follow the disassembly procedure in reverse order.

## WITH OIL COOLER TYPE



## DISASSEMBLY



## Disassembly

1. Drain plug
2. Cartridge oil filter
3. Nut
4. Oil cooler

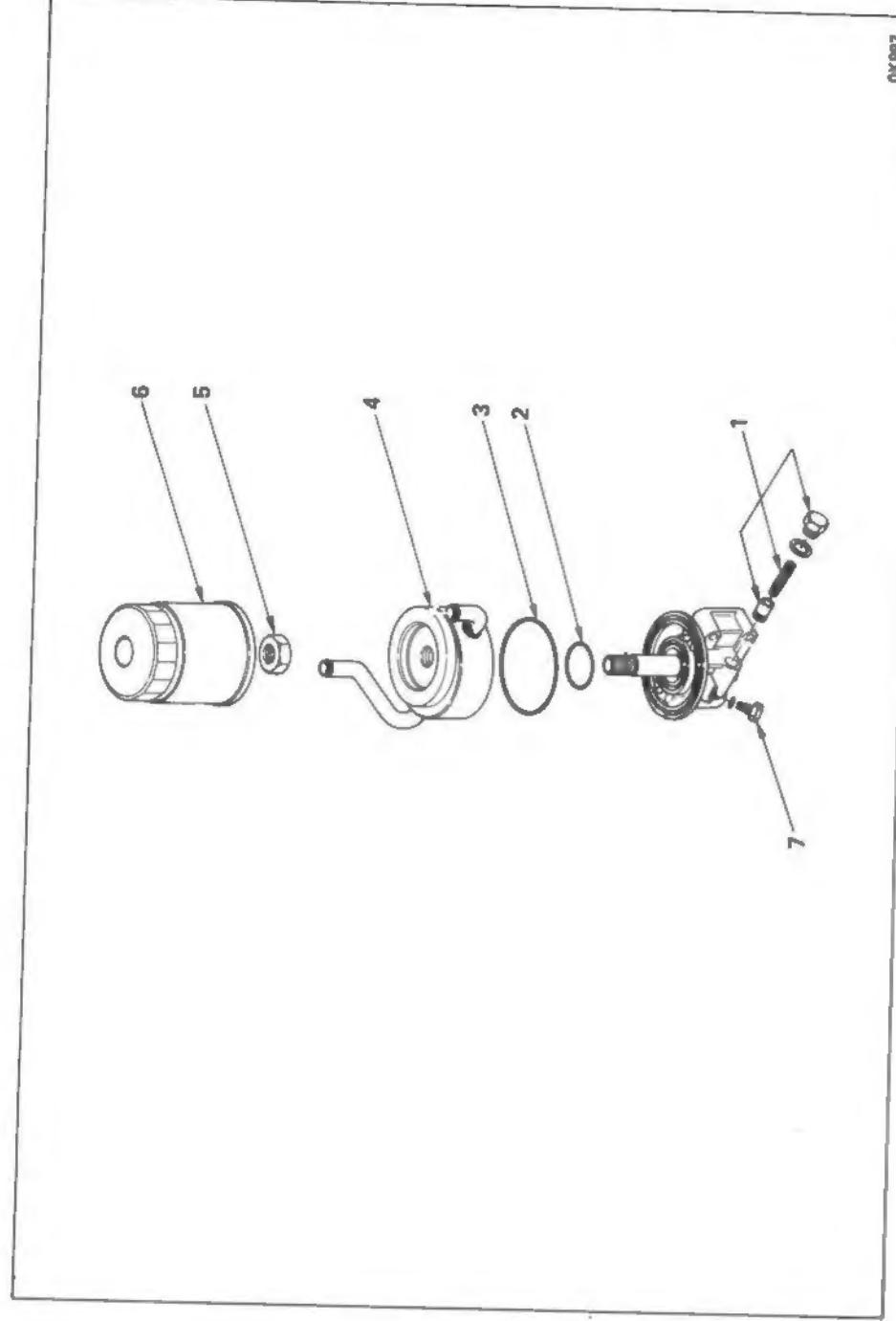


## INSPECTION AND REPAIR

Make necessary correction or parts replacement if damage or any other abnormal conditions are found through inspection.



## REASSEMBLY



## Reassembly steps

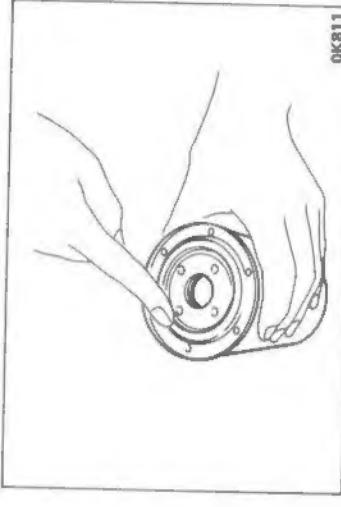
1. Oil cooler relief valve assembly
2. O-ring
3. O-ring
4. Oil cooler
5. Nut
6. Cartridge oil filter
7. Drain plug



## Important operations

## 6. Nut

Torque (kg-m)	2.5 – 3.5
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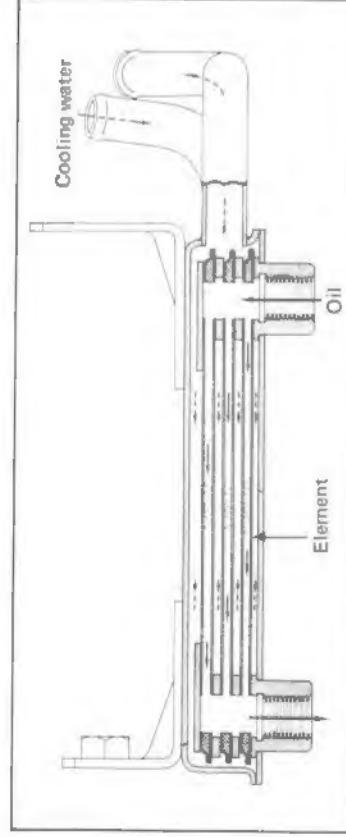
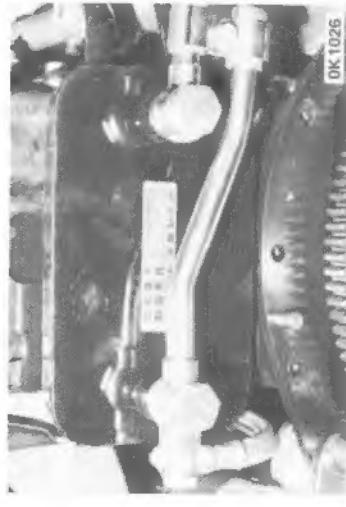


6. Cartridge oil filter
 

Apply engine oil to O-ring.  
Turn in filter until sealing face is brought into connect with the O-ring. Further tighten 2/3 of a turn.

## OIL COOLER

C240 type



## SECTION 4

# COOLING SYSTEM

## SECTION 4

## INDEX

## CONTENTS

## General description

Notes

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INSPECTION AND REPAIR

Make necessary correction or parts replacement if damage or any other abnormal conditions are found through inspection.

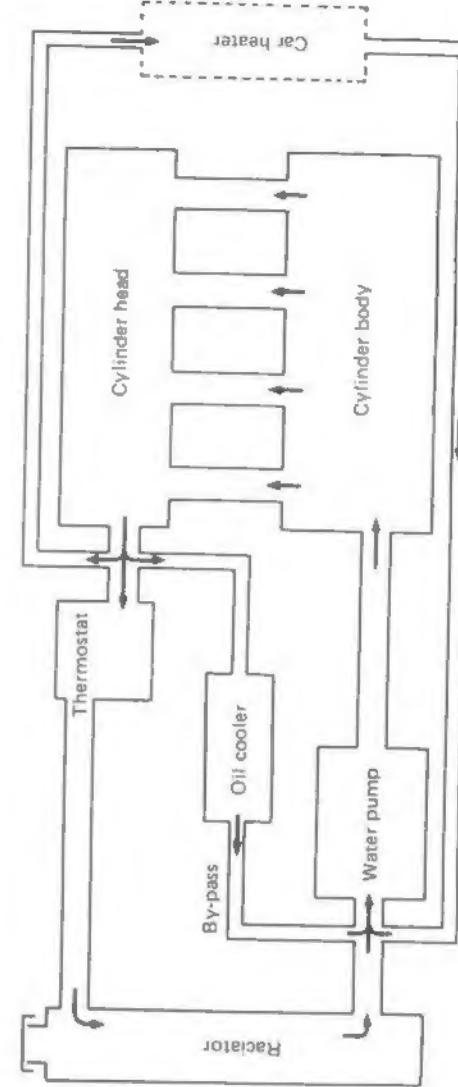
## OIL-JET PIPE AND BEGINNATION VALUE

INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection



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Apply a light pressure onto the valve with a screw driver and check that valve operates smoothly.

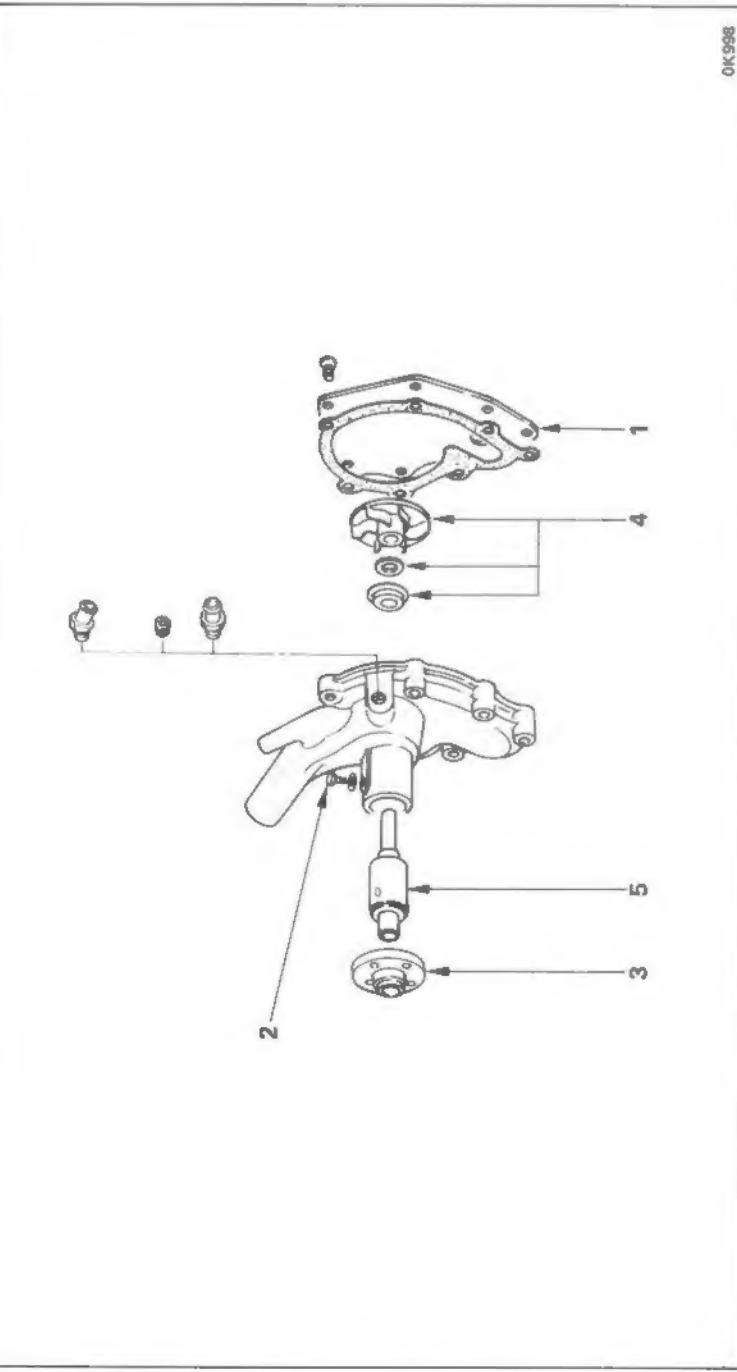
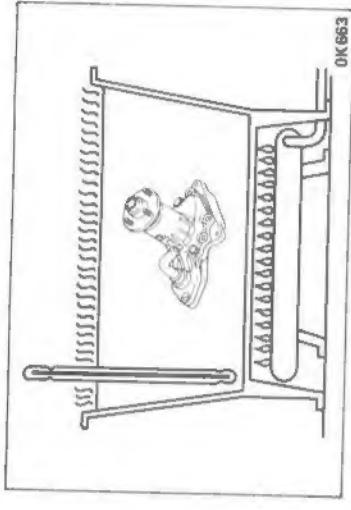
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Water pump .....	4—2
Thermostat .....	4—6

## WATER PUMP



## DISASSEMBLY



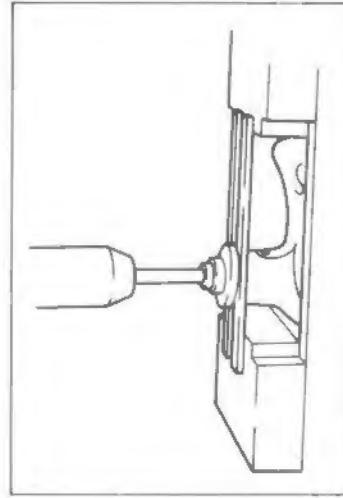
## Disassembly steps

- 1. Cover
- 2. Set screw
- ▲ 3. Fan center
- ▲ 4. Impeller and seal unit
- 5. Bearing unit



## Important operation

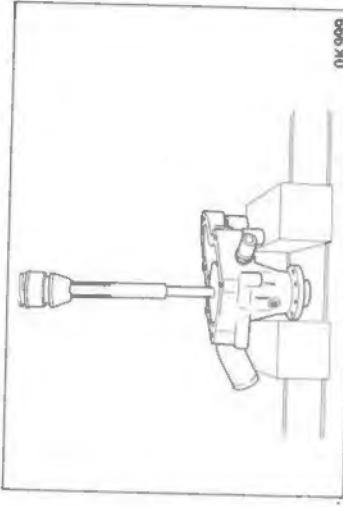
- 3. Fan center
- Remover.



4. Impeller and seal unit  
For aluminum body only.  
Heat the pump body in hot water (80 ~ 90°C).

Remove impeller using a bench press and a suitable bar.

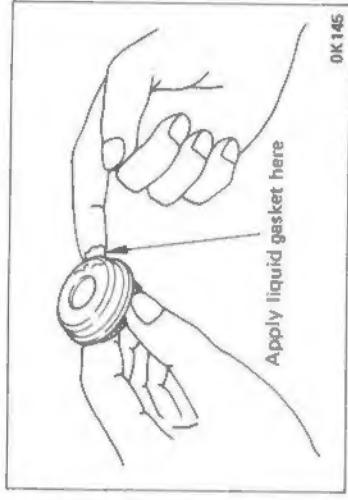
4. Impeller and seal unit  
For aluminum body only.  
Heat the pump body in hot water (80 ~ 90°C).



## INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal condition are found through inspection.




**REASSEMBLY**


3. Impeller and seal unit  
Apply a thin coat of liquid gasket; BELCO BOND No.4 to the outer periphery of seal unit before installing the seal unit.



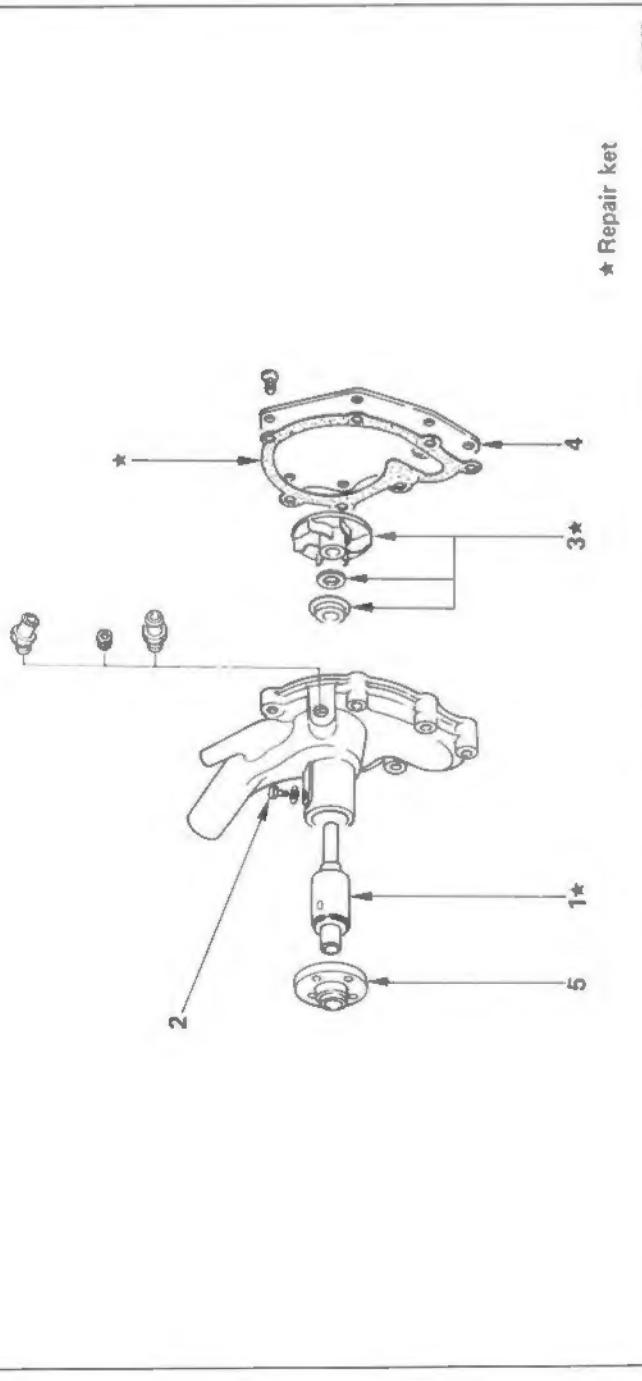
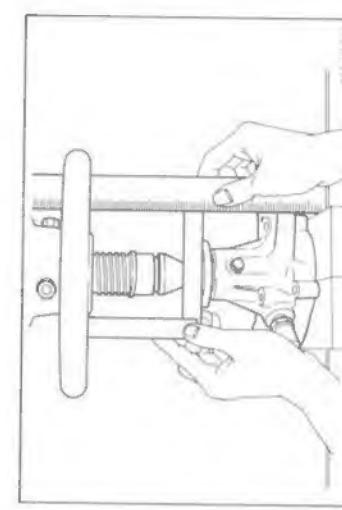
3. Impeller and seal unit  
Install the impeller in position using bench press, so that the specified clearance is provided between the impeller and pump body.

Clearance (mm)	0.3 – 0.6
Depth (mm)	1

Clearance (mm)	0.3 – 0.6
Depth (mm)	1



5. Fan center  
After installation, check that rear face of the impeller is indented from the face of the pump body.

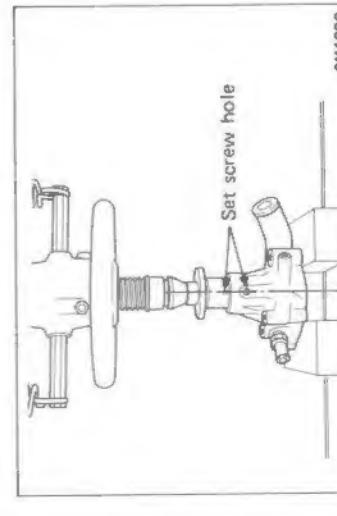

**Reassembly steps**

- ▲ 1. Bearing unit
- ▲ 2. Set screw
- ▲ 3. Impeller and seal unit

OK998


**Important operations**
**1. Bearing unit**

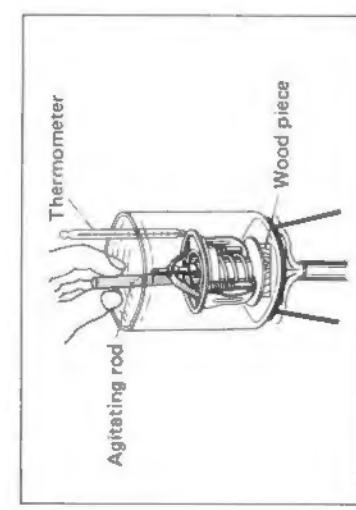
Press the bearing unit into place by aligning set screw hole in bearing with that in the pump body, then secure the bearing unit in position with the screws.



## THERMOSTAT

## INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.



	Valve opening temperature	Valve lift at testing temperature
	82°C	8mm at 95°C

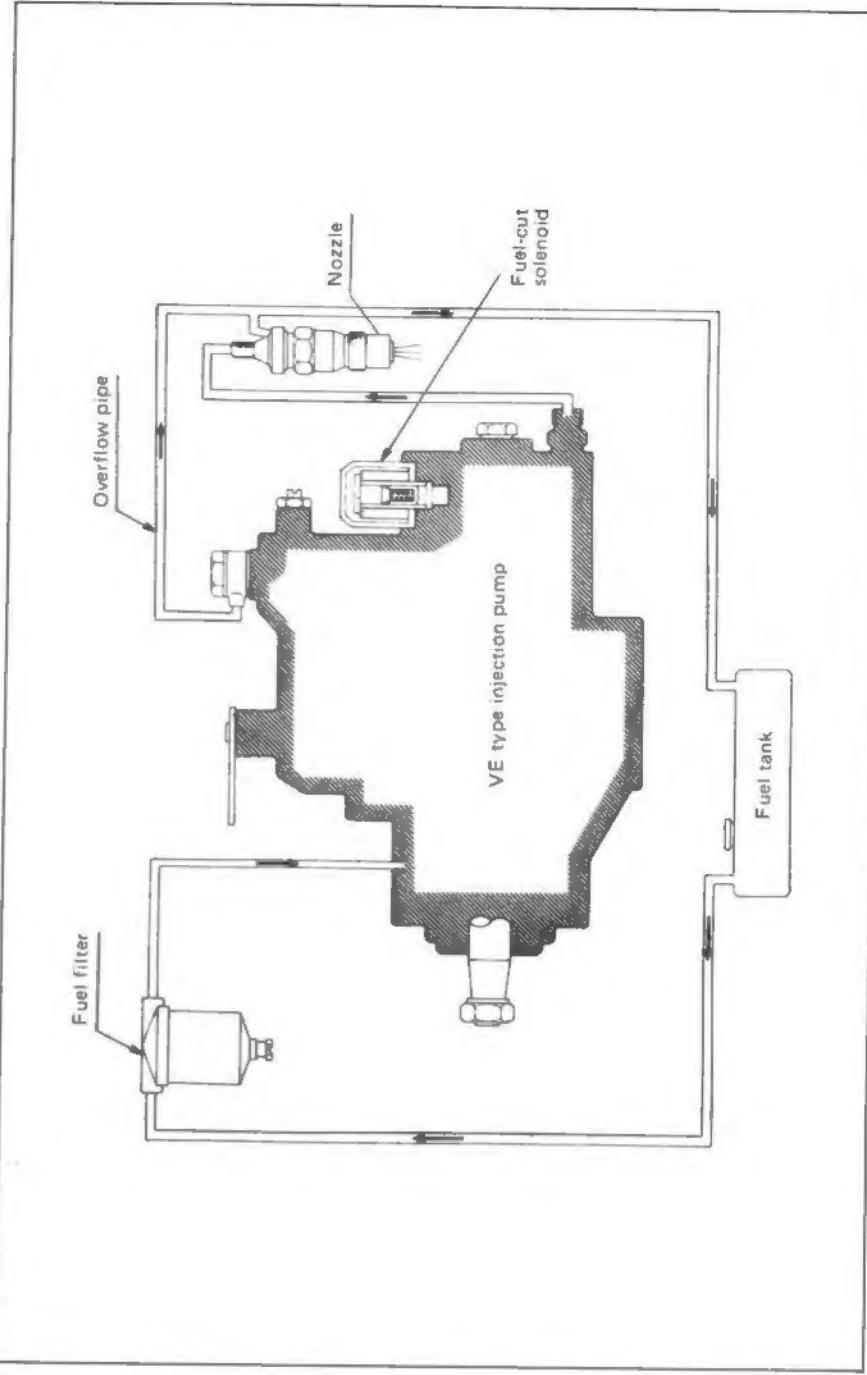
SECTION 5  
FUEL SYSTEM

## INDEX

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Injection nozzle	5-3
Injection pump data	5-4

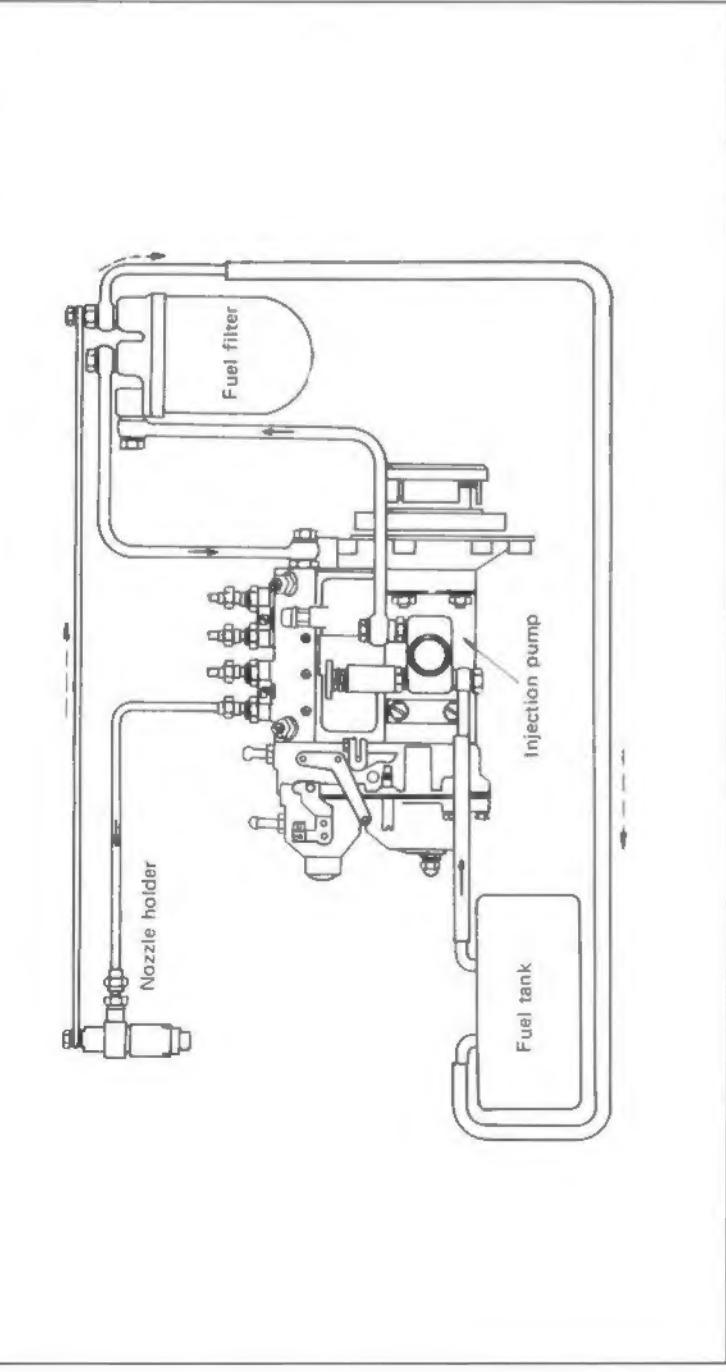
## GENERAL DESCRIPTION

## C190GB model

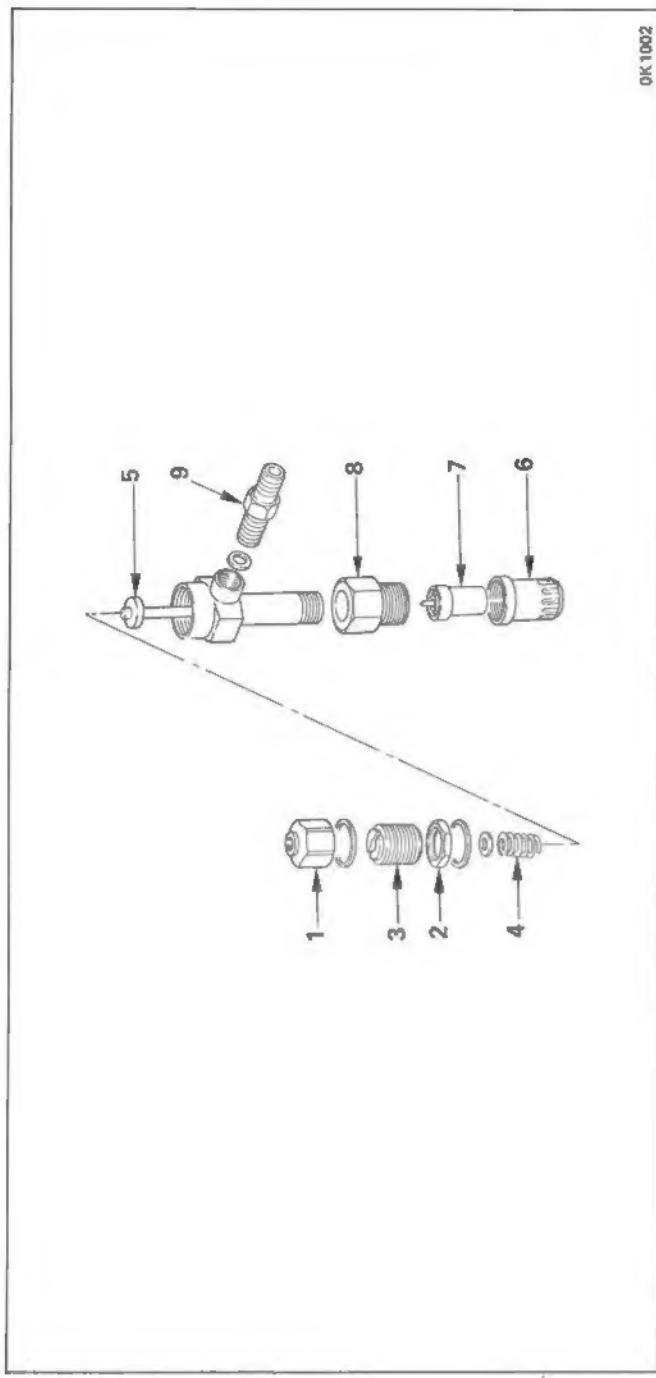


## C190, C240 models

## INJECTION NOZZLE



## DISASSEMBLY



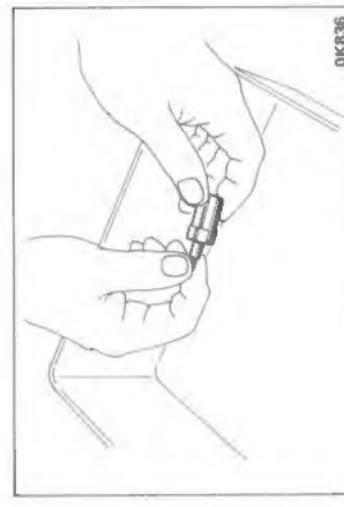
## Disassembly steps

1. Screw cap nut
2. Nut
3. Adjusting screw
4. Nozzle spring
5. Push rod
6. Nozzle nut
7. Nozzle
8. Nozzle holder screw
9. Connector
10. Edge filter

## Important operation

## 7. Nozzle

After removal of nozzle assembly from the nozzle body, keep them separate to maintain proper needle valve to body combinations.



## REASSEMBLY

To reassemble, follow the disassembly procedure in reverse order. Refer to "FUEL SYSTEM" in section 1 "General information" on page 1 - 19 for injection of spraying condition and injection starting pressure adjustment.

## INJECTION PUMP DATA (C190GB, C190KE models)

### INJECTION VOLUME ADJUSTMENT

TEST CONDITIONS	
Injection nozzle	* D.K.C. P.No 105780-0000 Bosch type No.DN12SD12T
Injection nozzle holder	D.K.C. P.No 105780-2080 Bosch type No.EF8511/9A
Injection line	150kg/cm <sup>3</sup> Inner dia. 2mm x Outer dia. 6mm — Length 840mm
Transfer pump pressure	0.2kg/cm <sup>2</sup>
Test diesel fuel	Bosch oil OL61V11 SAE standard test oil (SAE 967.C)
Testing oil temperature	46 — 54°C
Identification number	104749-1020, 104749-1030
* D.K.C. Diesel Kiki Co., Ltd	

### IDENTIFICATION PLATE AND NUMBER

MAKER /	<b>894225 2471</b>
ASSY NO	
INJ PUMP	<b>104748-1010</b>
ASSY NO.	

### INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

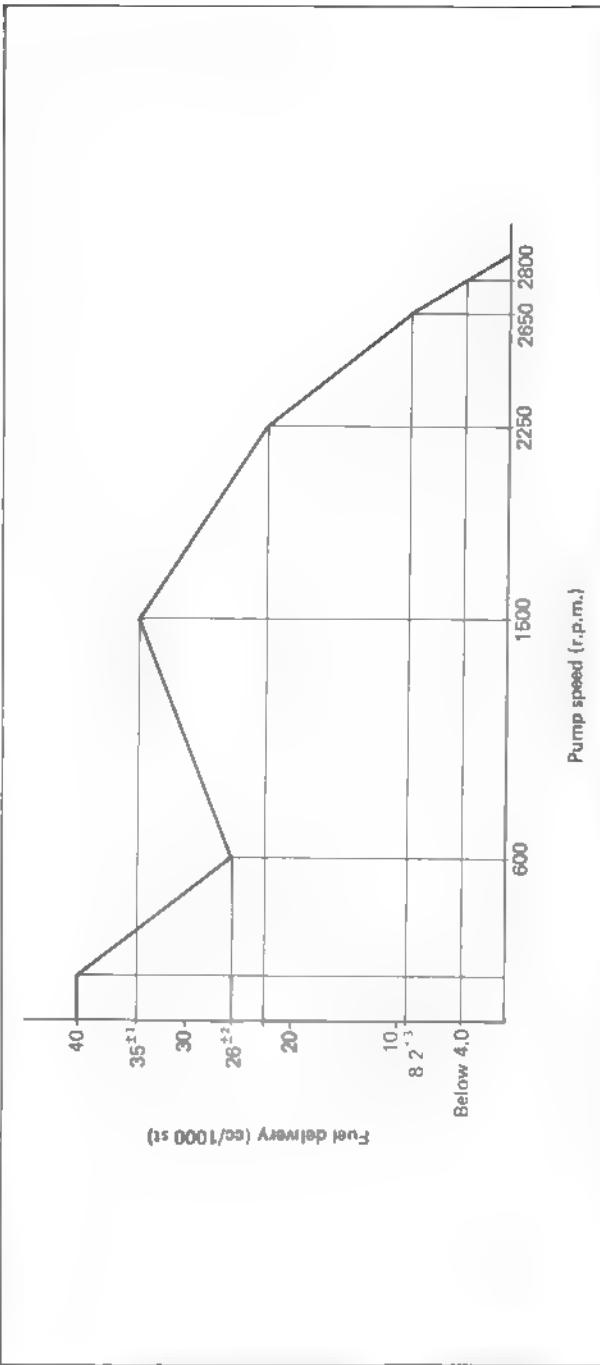
Identification number : 104749-1030

Test diesel fuel : Bosch diesel fuel OL61V11

1	Settings	Pump Speed (r/min)	Fuel delivery (cc/1000st)
1 1	Idle speed regulation	315	47-8.7
1 2	Start	100	Above 58
2 Test Specifications			
2.1 Timing device			
N = rpm mm		1000 0 9-21	1500 3 6-4 2
N = rpm kg/cm <sup>2</sup>		1000 3 9-4 5	1500 5 3-5 7
2.2 Supply pump			
N = rpm cc/10s		1000 48-91	1000 6 6-7 2
2.3 Fuel deliveries			
Speed control lever		Pump speed (r/min)	Fuel delivery (cc/1000st)
End stop		1500	34 6-36 6
600		24 4-28 4	
2225		30 3-34 3	
2650		5 2-11 2	
2800		Below 4.1	
Switch-off		0	
Idle stop		315	4 7-8 7
365		Below 3.6	10 5-14.6 mm
Cold start device		0	19-23mm Cancel
560-760		Max. cut-in voltage test voltage	8V 12V-14V
When adjusting injection volume, use the correct data following the injection pump identification number			
3 Dimensions			
Design- nation		For assembly and adjustment (mm)	
K		3.2-3 4	
KF		5 7-5 9	
MS		1 7-1 9	
cr		2 1-29 deg.	
A		7.5-11 mm	
Observations			

N : Pump speed

### GOVERNOR PERFORMANCE DIAGRAM



## INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

Identification number : 104749-1030

Test diesel fuel : SAE standard test diesel fuel SAE967C

1	Settings	Pump Speed (rpm)	Fuel delivery (cc/1000st.)
1.1	Idle speed regulation	315	45-85
1.2	Start	100	Above 57

2	Test Specifications	N = rpm mm	1000 0.9-21	1500 3.5-41	2300 6.9-78
2.1	Timing device	N = rpm kg/cm <sup>2</sup>	1000 3.8-4.4	1500 5.2-5.6	2150 6.5-7.1
2.2	Supply pump	N = rpm cc/10s	1000 5.2-95		

2.3	Fuel deliveries Speed control lever	Pump speed (rpm)	Fuel delivery (cc/1000st.)	
End stop	1500	33.7-36.7		
	600	23.8-27.8		
	2225	29.5-33.5		
	2650	5.0-11.0		
	2800	Below 4		
Switch-off	315	0		
Idle stop	315	4.5-8.5		
	365	Below 3.5		
Cold start device	0	1.9-2.3mm Cancel		
2.4 Solenoid	600-800	Max. cut-in voltage test voltage	12V	

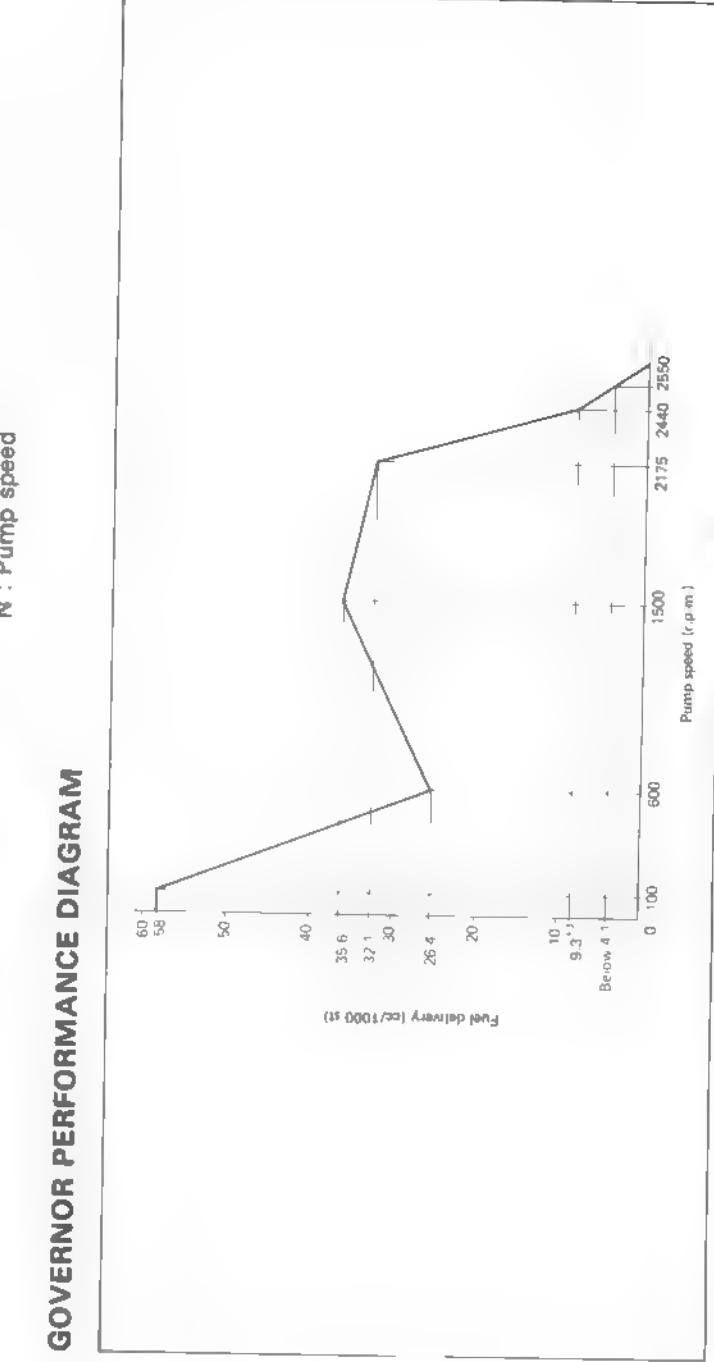
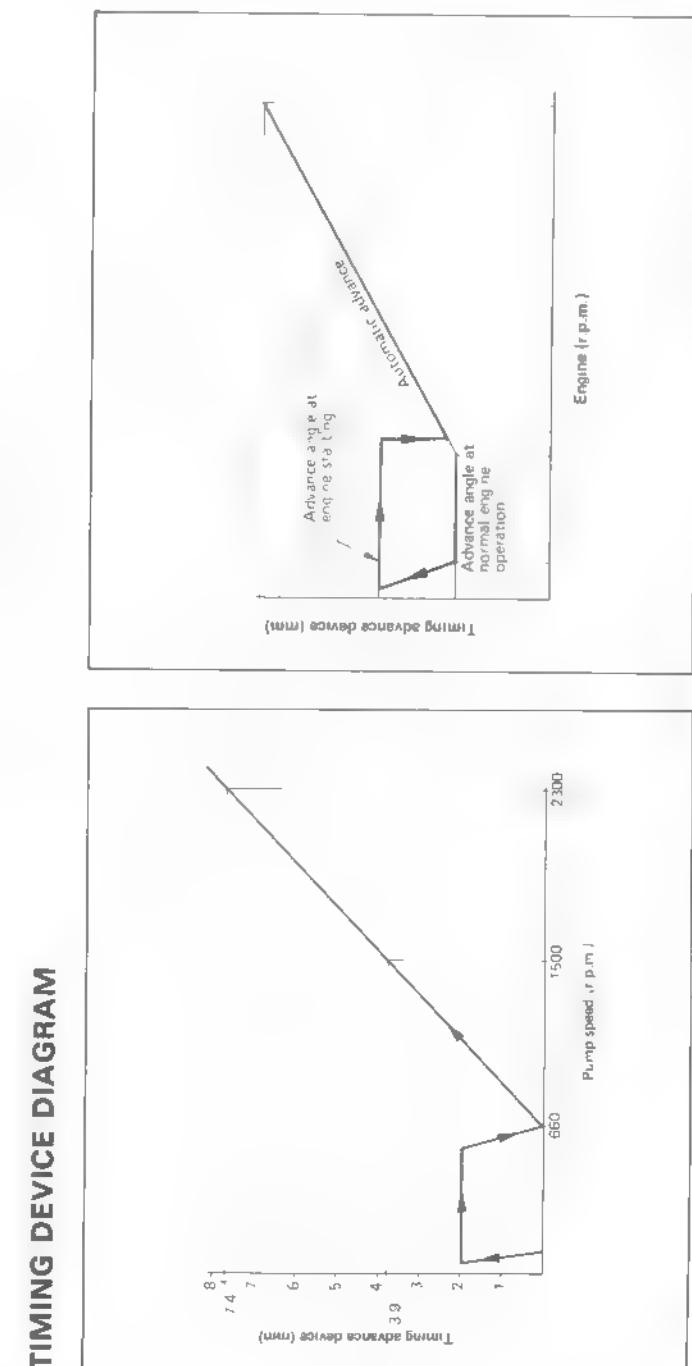
N : Pump speed

N : Pump speed

N : Pump speed

GOVERNOR PERFORMANCE DIAGRAM

TIMING DEVICE DIAGRAM



## INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

Identification number : 104749-1020

Test diesel fuel : Bosch diesel fuel OL61V11

1	Settings	Pump Speed (rpm)	Fuel delivery (cc/1000st.)	
1.1	Idle speed regulation	315	45-85	
1.2	Start	100	Above 58	

2	Test Specifications	N = rpm mm	N = rpm mm	N = rpm mm
2.1	Timing device	1000 0.9-21	1500 3.6-4.2	2300 7.0-7.8
2.2	Supply pump	1000 3.9-4.5	1500 5.3-5.7	2150 6.6-7.2
	Overflow delivery	1000 48-91		

3	Dimensions	Design- nation	For assembly and adjustment (mm)	
		K	3.2-3.4	
		KF	5.7-5.9	
		MS	1.7-1.9	
		$\alpha$	21-29 deg	
		A	7.5-11 mm	
		$\beta$	36-46 deg	
		B	10.5-14.5 mm	
		Observations		

## INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

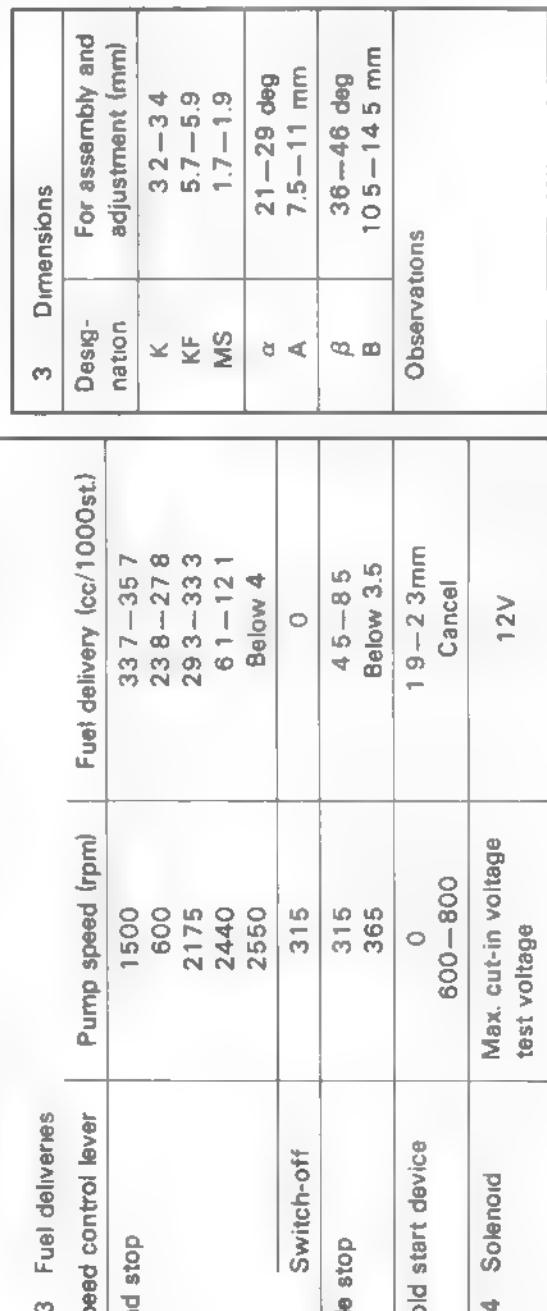
Identification number : 104749-1020

Test diesel fuel : SAE standard test diesel fuel SAE987C

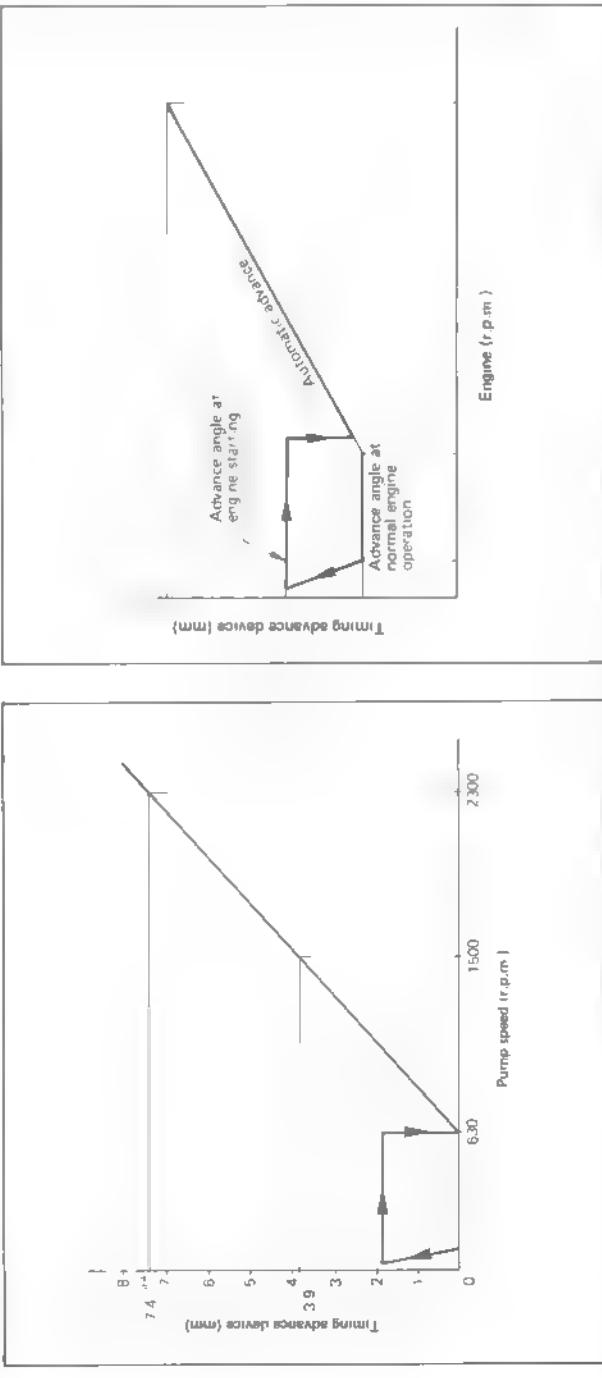
INJECTION PUMP DATA  
(C190, C240 models)

## INJECTION VOLUME ADJUSTMENT

1	Settings	Pump Speed (rpm)	Fuel delivery (cc/1000st.)
1.1	Idle speed regulation	315	45-85
1.2	Start	100	Above 57
2 Test Specifications			
2.1	Timing device	N = rpm mm	1000 1500 2300 0.9-2.1 3.6-4.1 6.9-7.8
2.2	Supply pump	N = rpm kg/cm <sup>2</sup>	1000 1500 2150 3.8-4.4 5.2-5.6 6.5-7.1
Overflow delivery			
2.3	Fuel deliveries	N = rpm cc/10s	1000 52-95
Speed control lever			
End stop			
2.1.1	1500	33.7-35.7	
2.1.2	600	23.8-27.8	
2.1.3	2175	29.3-33.3	
2.1.4	2440	6.1-12.1	
2.1.5	2550	Below 4	
Switch-off			
2.2.1	315	0	
2.2.2	315	4.5-8.5	
2.2.3	365	Below 3.5	
Idle stop			
2.3.1	0	1.9-2.3mm	
2.3.2	600-800	Cancel	
Cold start device			
2.4.1	Max. cut-in voltage test voltage	12V	



N : Pump speed



## TIMING DEVICE DIAGRAM

\* D.K.C. P No 105780-0000  
Bosch type No.DN12SD12T  
D.K.C. P.No.105780-2080  
Bosch type No.EF8511/9A  
175kg/cm<sup>2</sup>  
Inner dia. 2mm x Outer dia. 6mm — Length 600mm  
1.6kg/cm<sup>2</sup>  
Bosch oil OI61V11 (Shell V-oil 1253)  
SAE standard test oil (SAE 967C)  
40 — 45°C



The injection volume should be adjusted by referring to the adjustment data applicable to the specific injection pump model as identified by ④.

④ Identification number

C190

C240

101421-4980

101421-7020

101421-4870

101431-0560

## INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

Identification No. : 101421-4980, 101421-7027

Bosch oil OL61V11

Control rack position (mm)	Pump speed (rpm)	Injection volume (cc/1000st.)	Deviation (%)	Remarks
11.7	1800	37.6-39.4	± 2.5	Basic
About 7.2	300	6.8-9.0	± 14	
	150	Above -54	-	

SAE standard test oil

Control rack position (mm)	Pump speed (rpm)	Injection volume (cc/1000st.)	Deviation (%)	Remarks
11.7	1800	36.1-37.9	± 2.5	Basic
About 7.2	300	5.9-8.1	± 14	
	150	Above -52	-	

## INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

Identification No. : 101421-4870

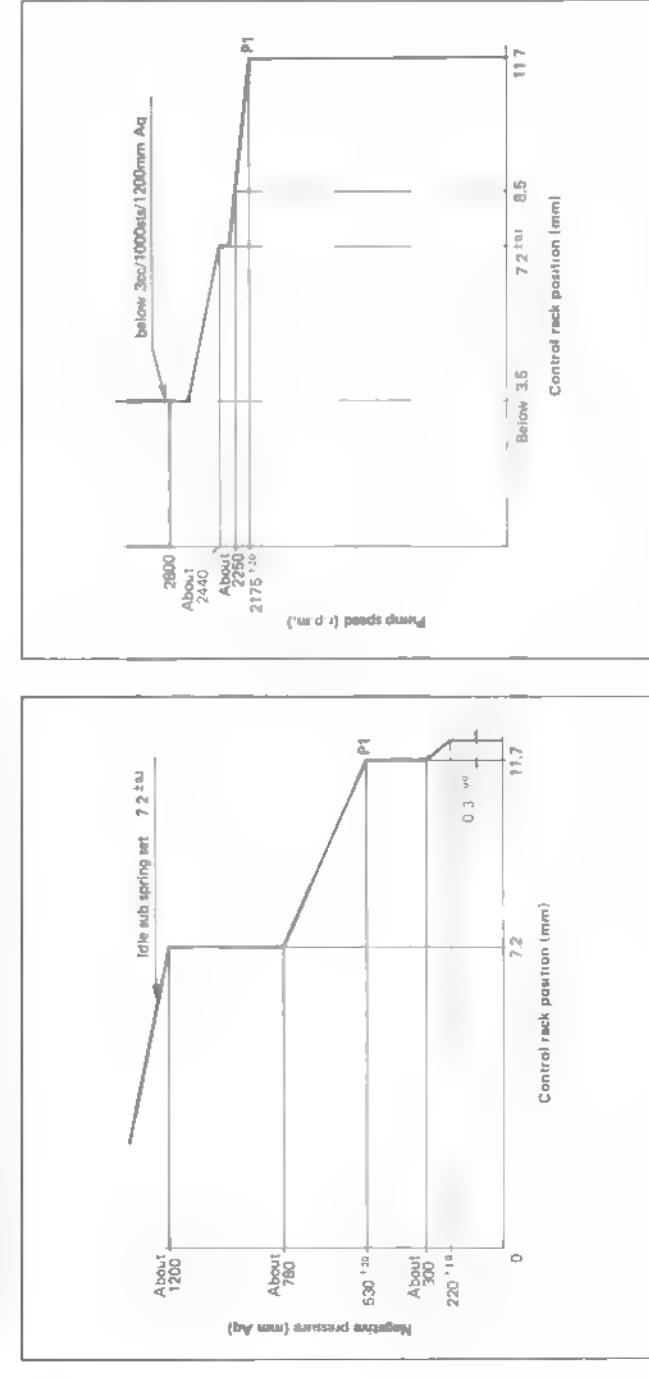
Bosch oil OL61V11

Control rack position (mm)	Pump speed (rpm)	Injection volume (cc/1000st.)	Deviation (%)	Remarks
11.7	1800	37.6-39.4	± 2.5	Basic
About 7.2	300	6.8-9.0	± 14	
	150	Above -54	-	

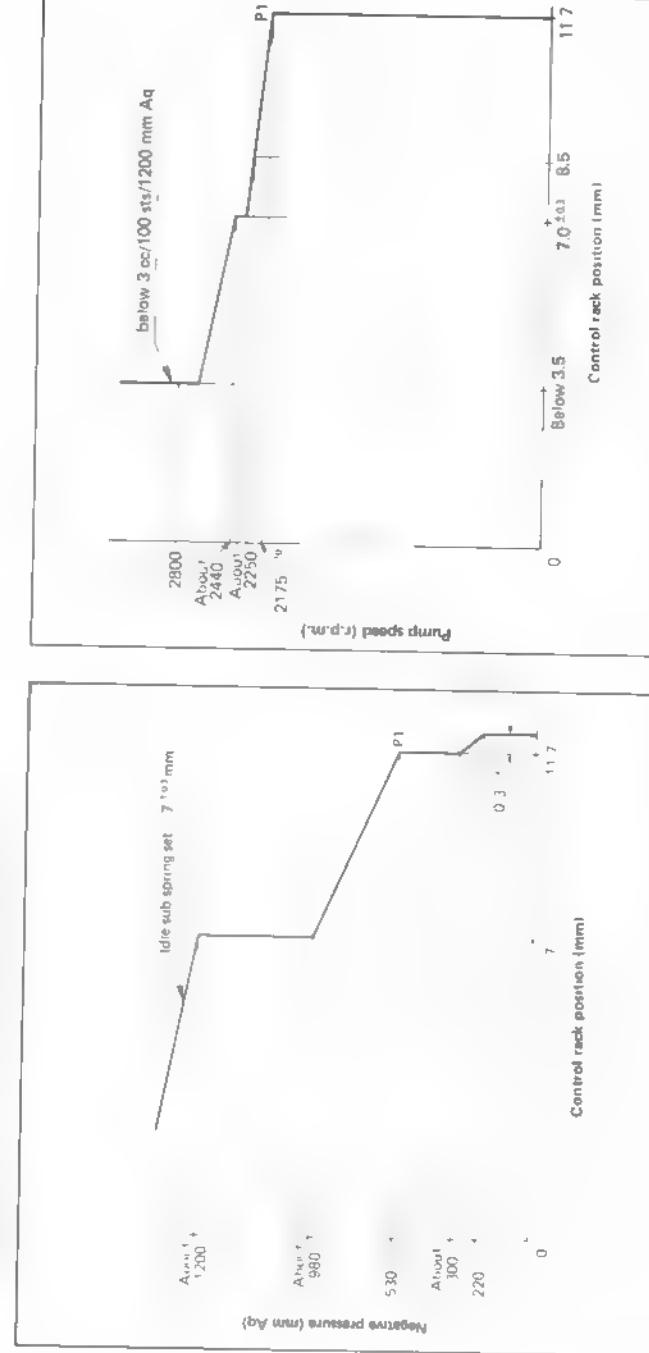
SAE standard test oil

Control rack position (mm)	Pump speed (rpm)	Injection volume (cc/1000st.)	Deviation (%)	Remarks
11.7	1800	36.1-37.9	± 2.5	Basic
About 7.2	300	5.9-8.1	± 14	
	150	Above -54	-	

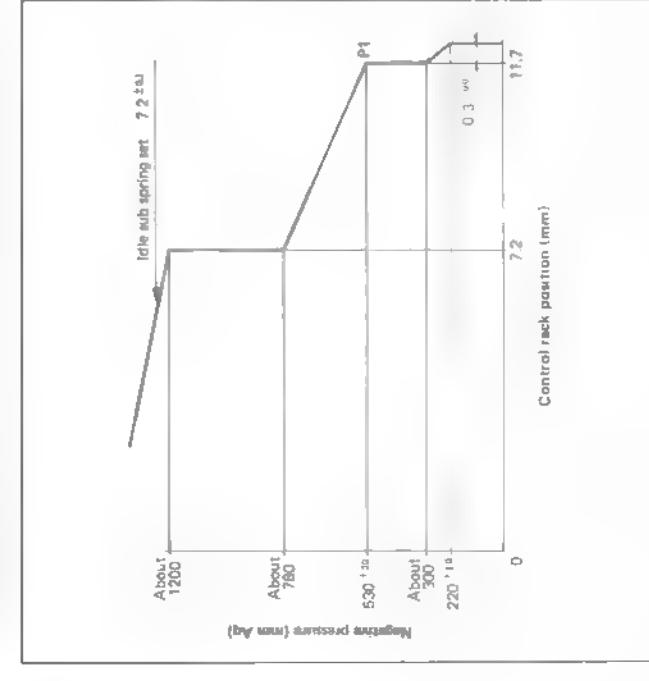
## GOVERNOR PERFORMANCE DIAGRAM



## GOVERNOR PERFORMANCE DIAGRAM



## GOVERNOR PERFORMANCE DIAGRAM



## INJECTION VOLUME AND GOVERNOR PERFORMANCE DIAGRAM

Identification No. : 101431-0550

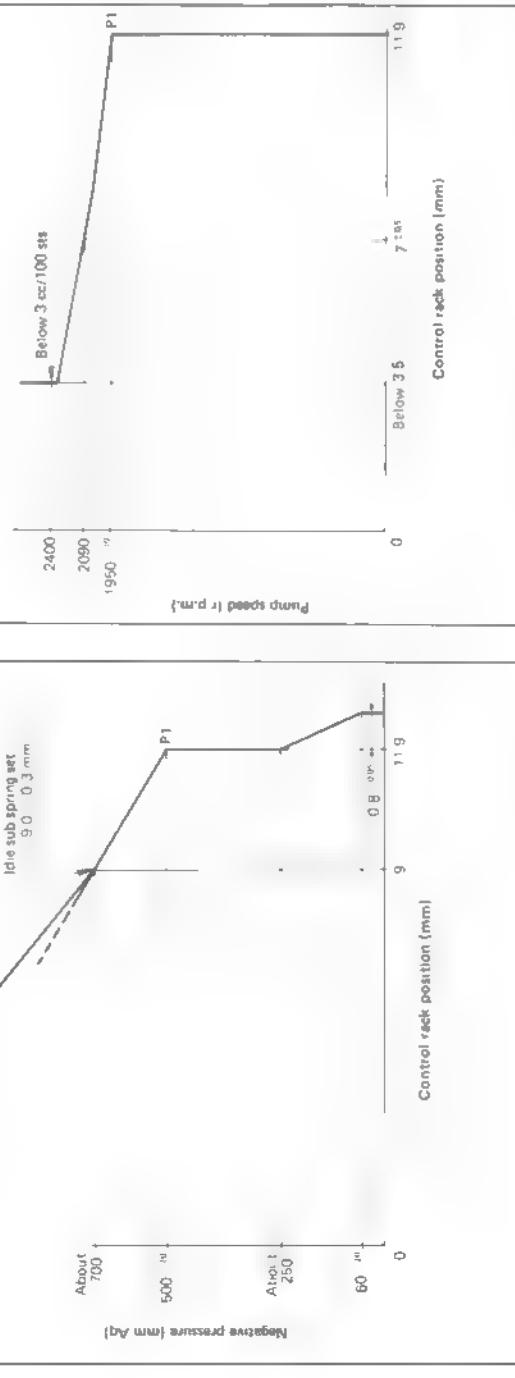
Bosch oil OL61V11

Control rack position (mm)	Pump speed (r.p.m.)	Injection volume (cc/1000st.)	Deviation (%)	Remarks
11.9	1900	42.7-44.7	$\pm 2.5$	Basic
8.4	300	7.9-10.1	$\pm 14$	

SAE standard test oil

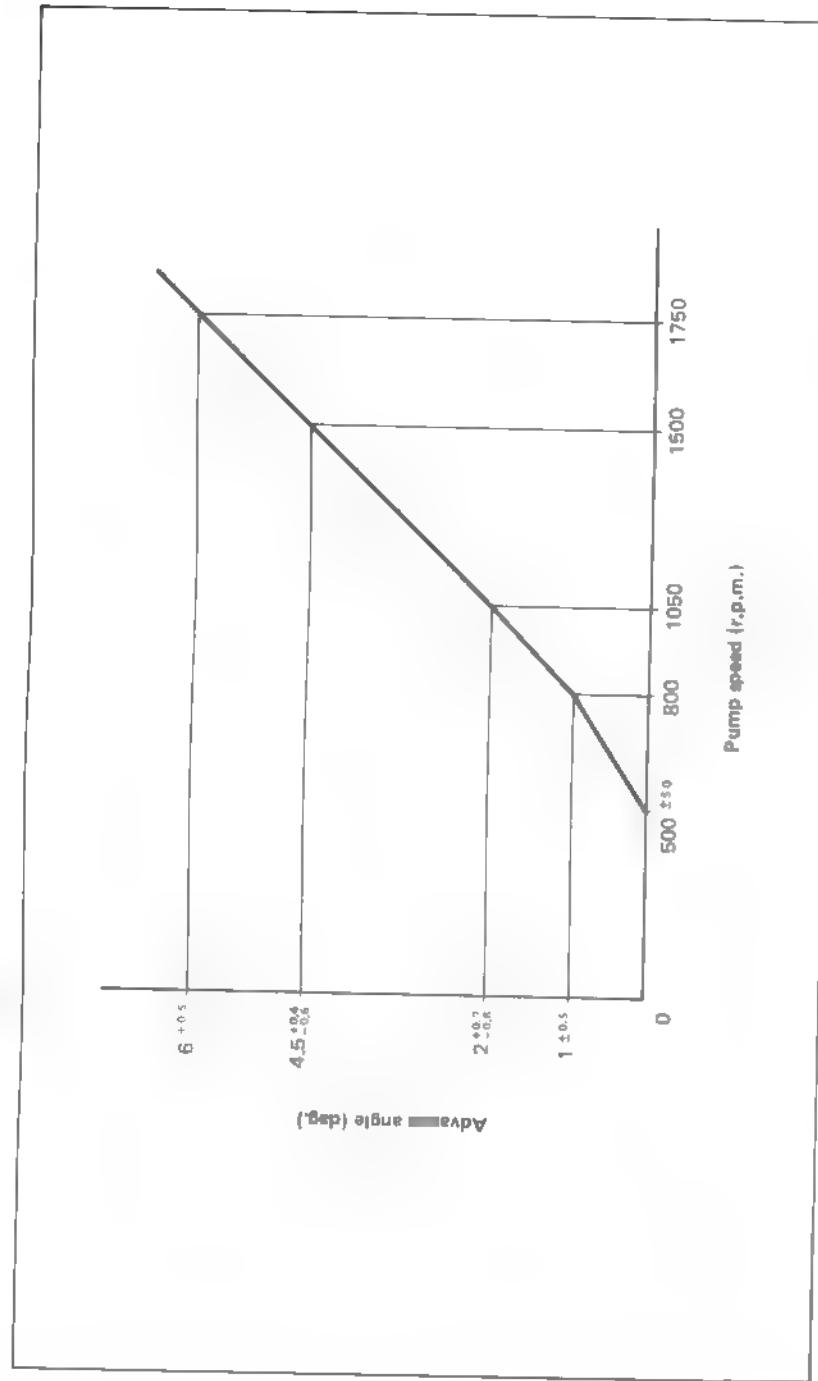
Control rack position (mm)	Pump speed (r.p.m.)	Injection volume (cc/1000st.)	Deviation (%)	Remarks
11.9	1900	41.0-43.0	$\pm 2.5$	Basic
8.4	300	6.9-9.1	$\pm 14$	

## GOVERNOR PERFORMANCE DIAGRAM

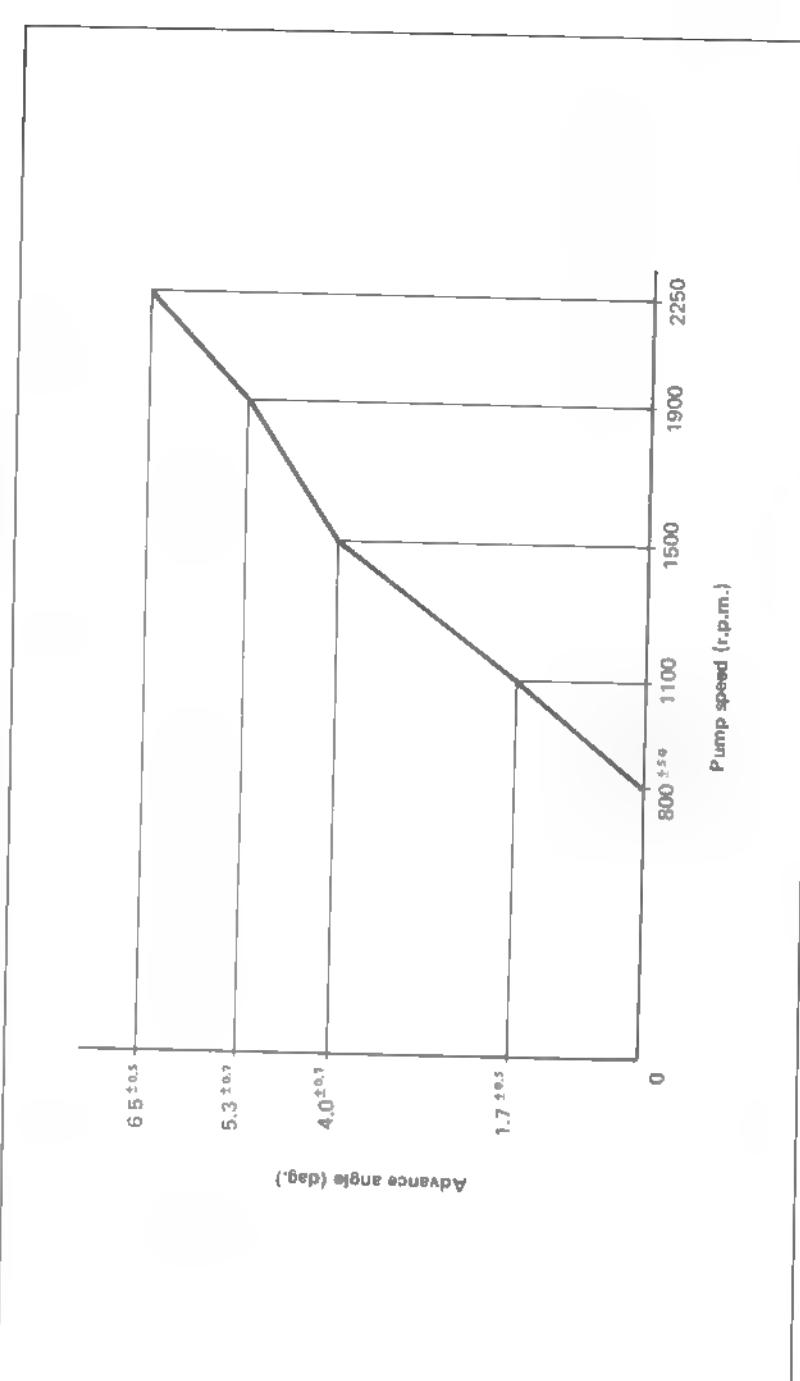


## AUTOMATIC TIMER CHARACTERISTIC DIAGRAM

Identification No.: 101431-0550



Identification No.: 101421-7020, 101421-4870, 101421-7020



## SECTION 6

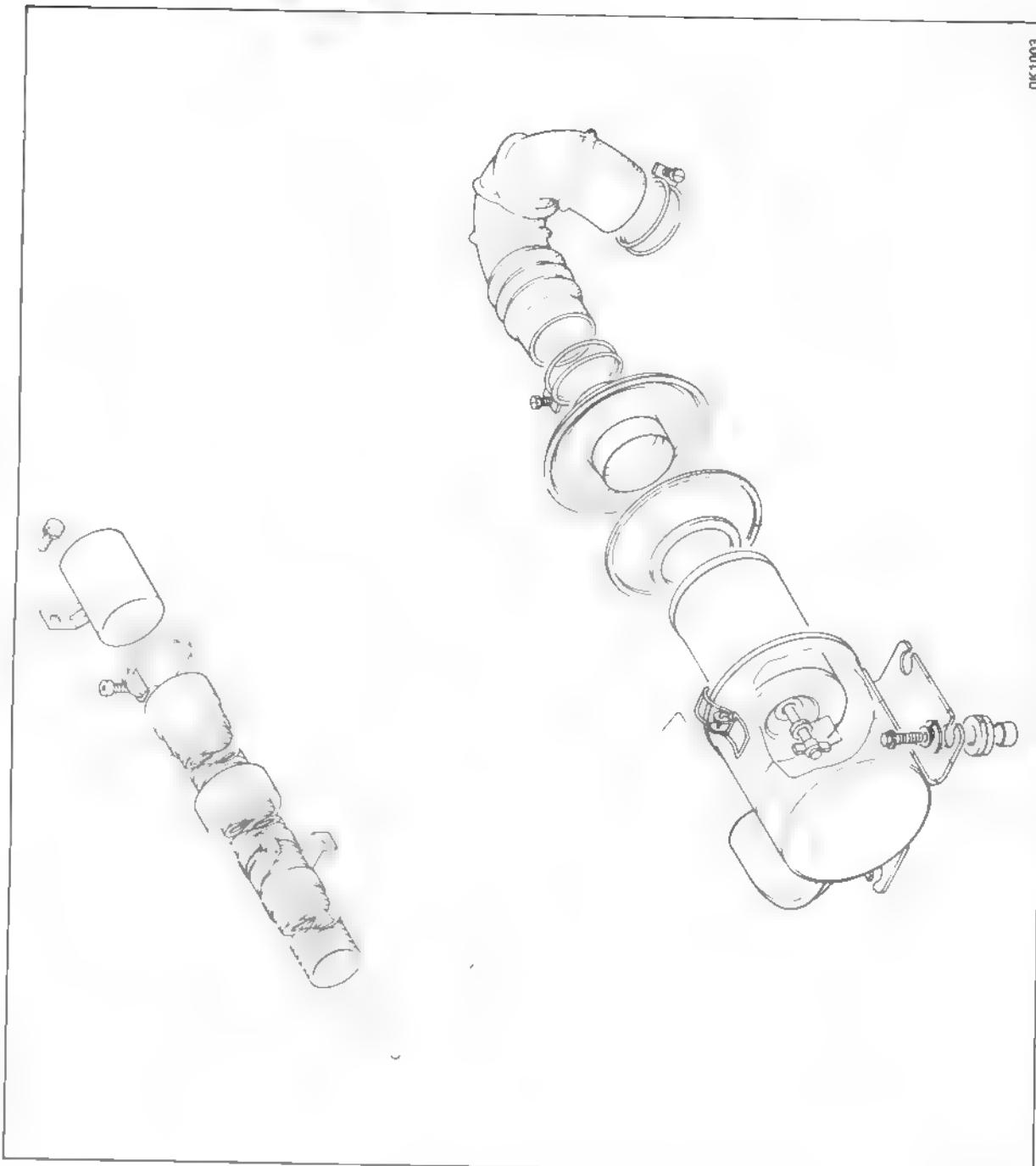
## INTAKE AND EXHAUST SYSTEM

CONTENTS	PAGE
General description — Intake system .....	6-1
General description — Exhaust system .....	6-5

## GENERAL DESCRIPTION

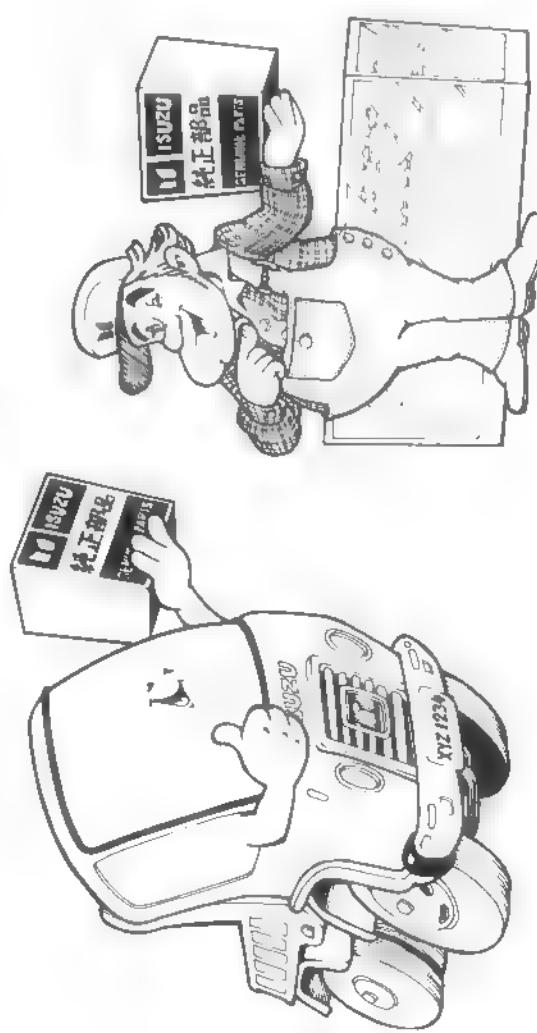
## INTAKE SYSTEM

PAD model

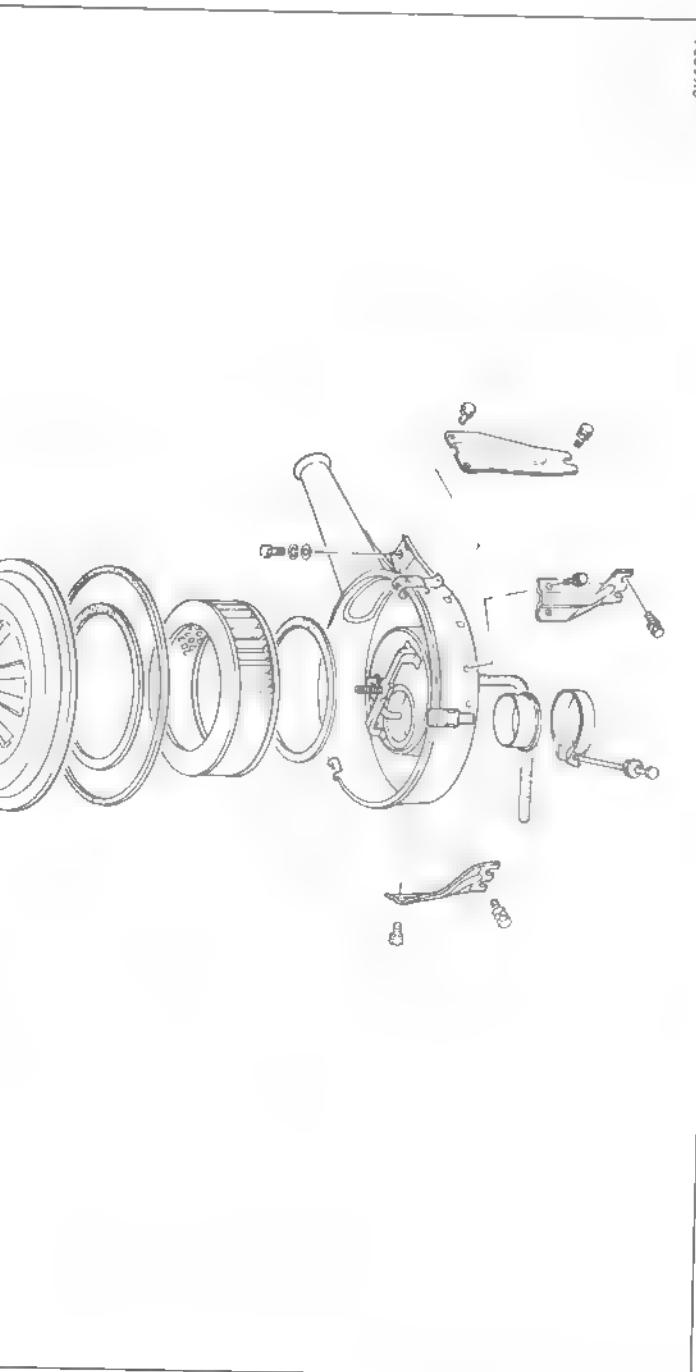


OK1003

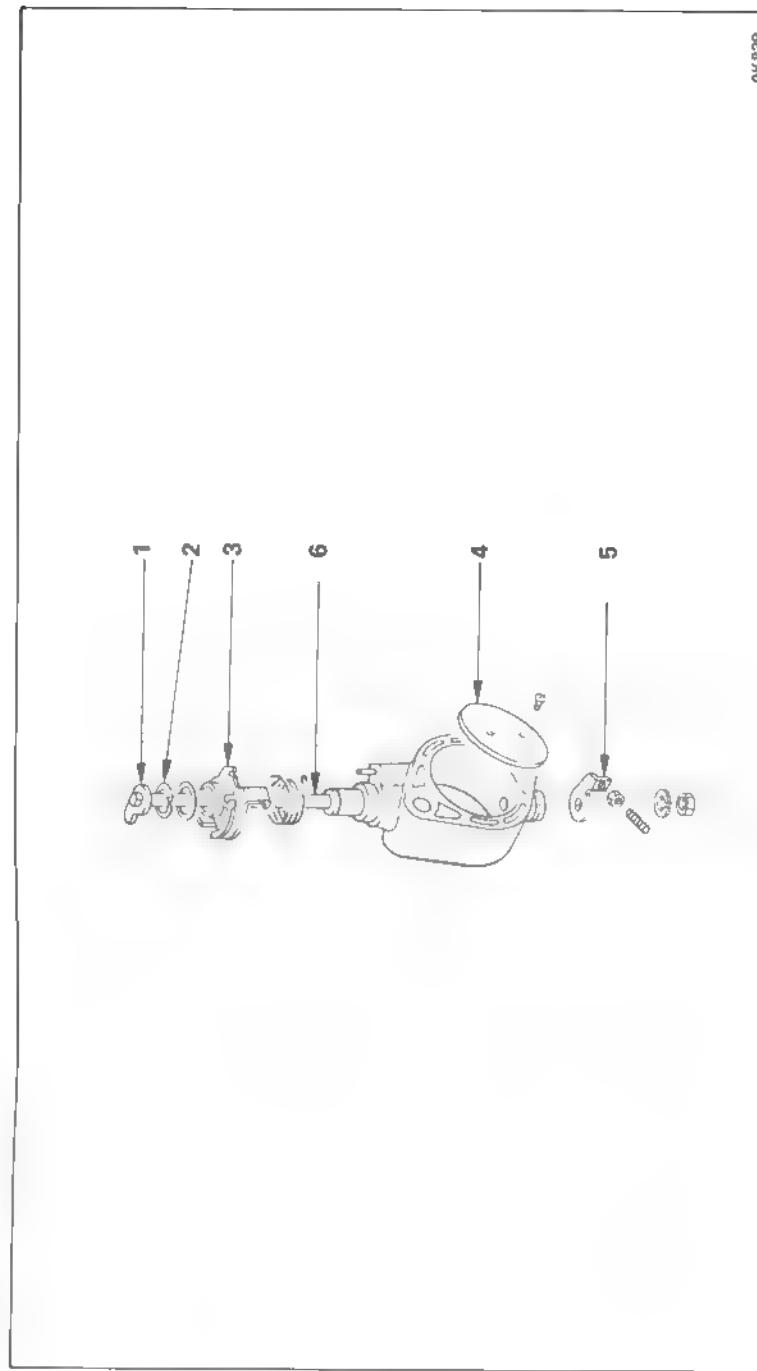
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## INTAKE MANIFOLD AND INTAKE SHUTTER



KAD and TLD models



OK839

## Disassembly steps

1. Intake shutter lever
2. Snap ring
3. Intake shutter lever
4. Intake shutter valve
5. Stopper lever
6. Intake shutter shaft



## INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.



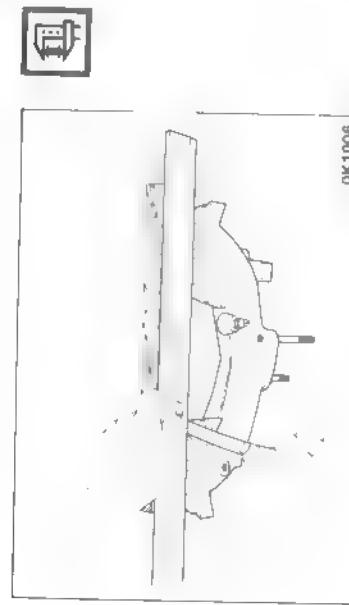
OK1005


**Clearance between shaft and bushing.**

	Standard	Limit	(mm)
	0.04 – 0.12	0.2	

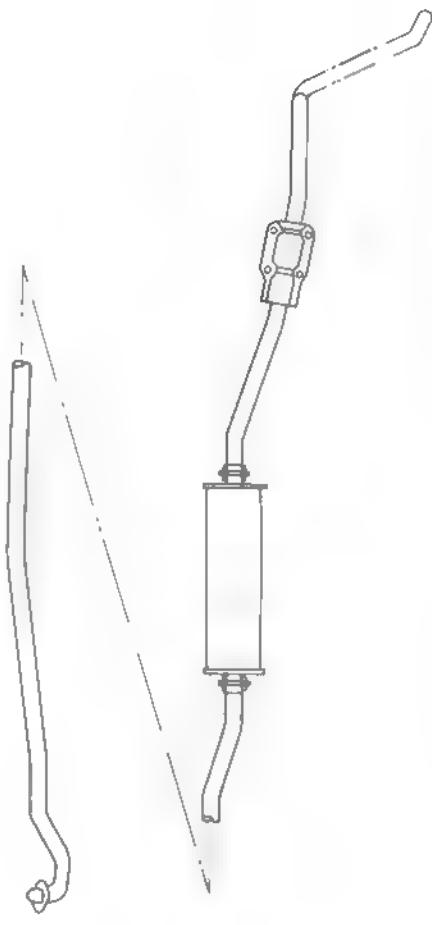

**Intake manifold**  
Check cylinder head fitting face of the intake manifold for distortion.

	Limit	(mm)	0.4



**REASSEMBLY**

To reassemble, follow the disassembly procedure in reverse order.


**KBD model**


0K1008

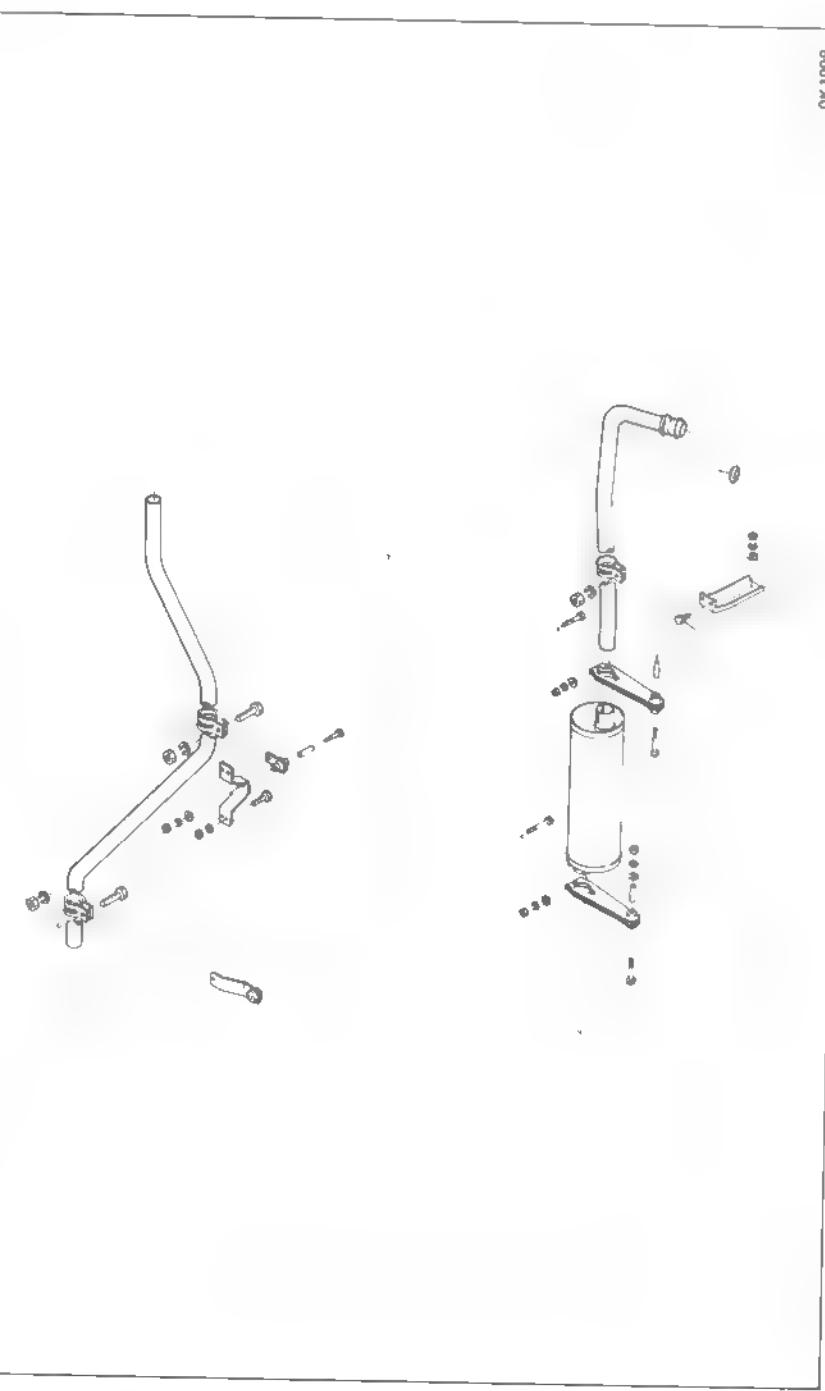

**EXHAUST SYSTEM**

**PAD model**


0K1007

0K1008

## KAD model



TLD model



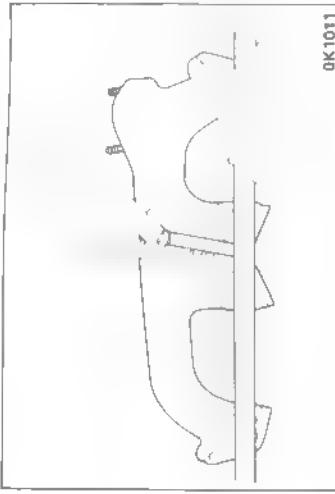
## EXHAUST MANIFOLD

 INSPECTION AND REPAIR

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection.



Check cylinder head fitting face of the manifold for distortion.



Limit (mm)	0.4
------------	-----

OK 1011

SECTION 7

# AUXILIARIES

INDEX

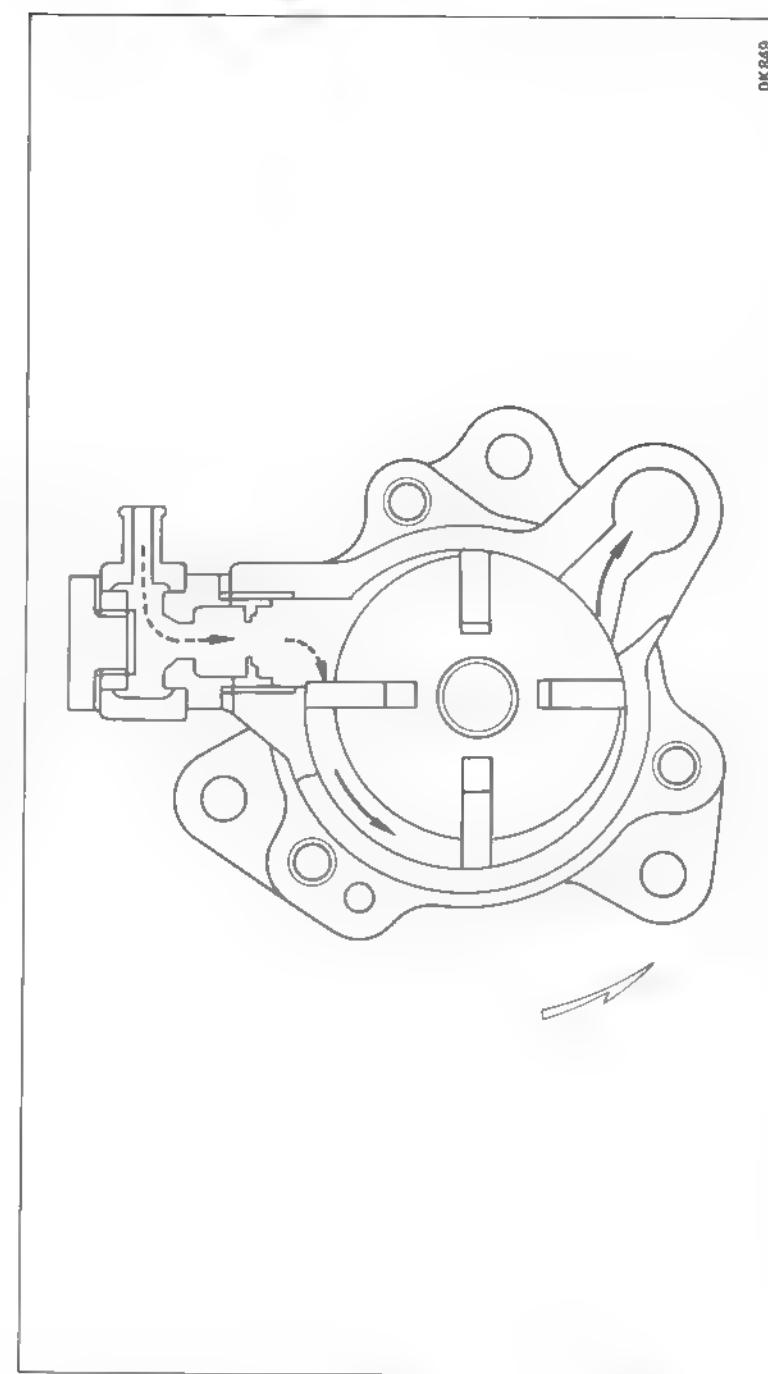
CONTENTS

PAGE
Vacuum pump ..... 7-1

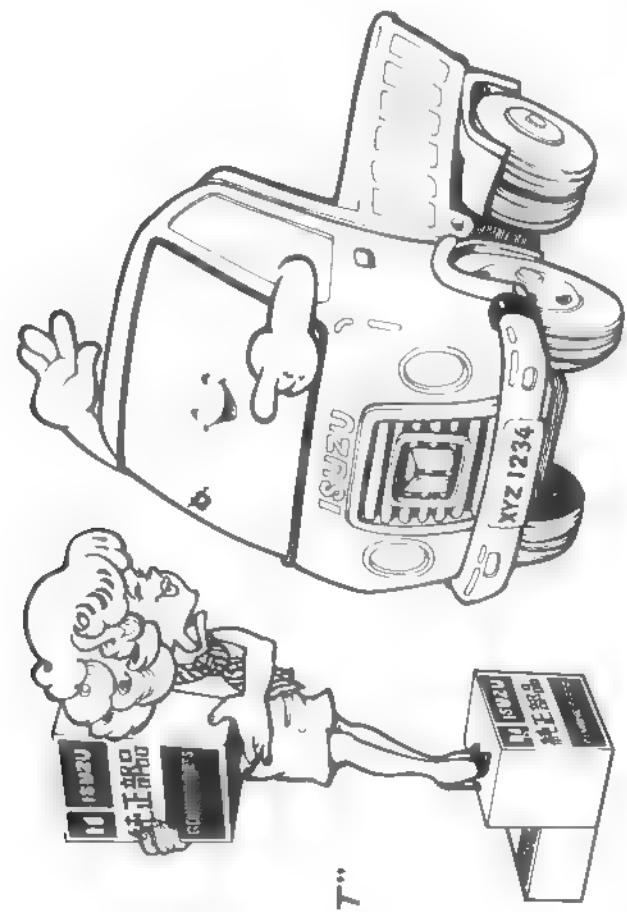
PAGE

7-1

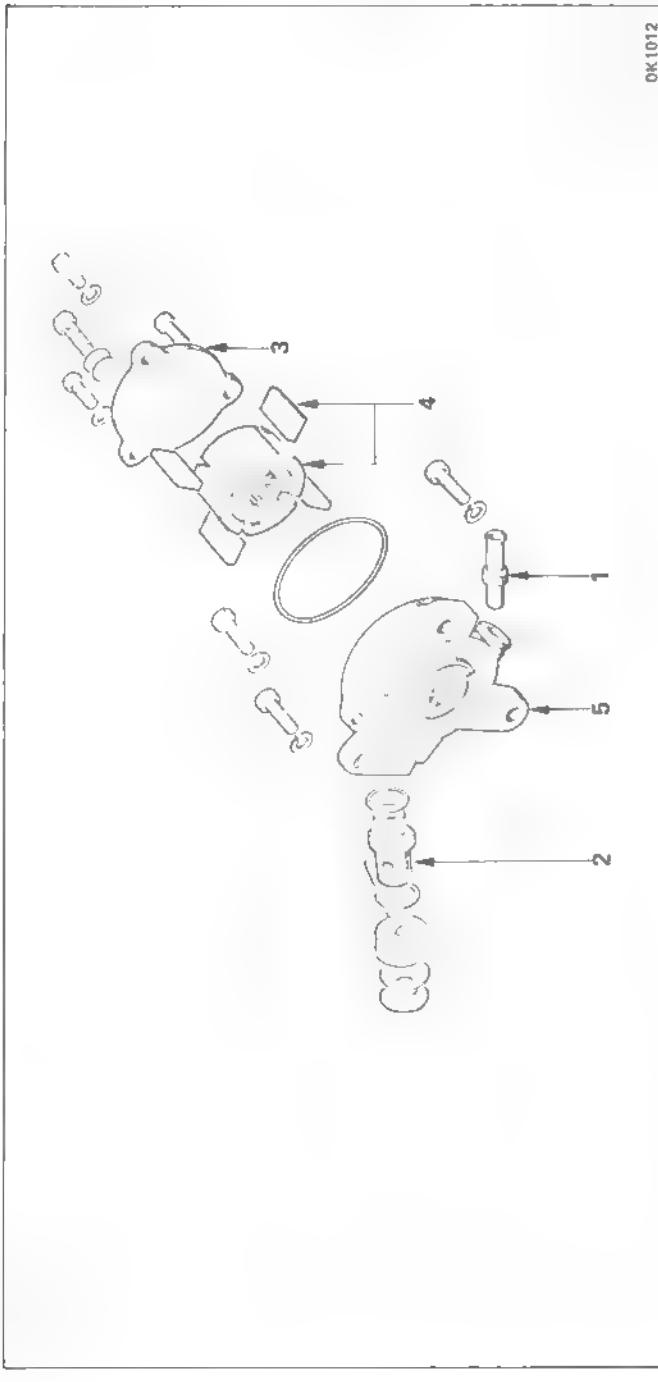
## VACUUM PUMP



OK849



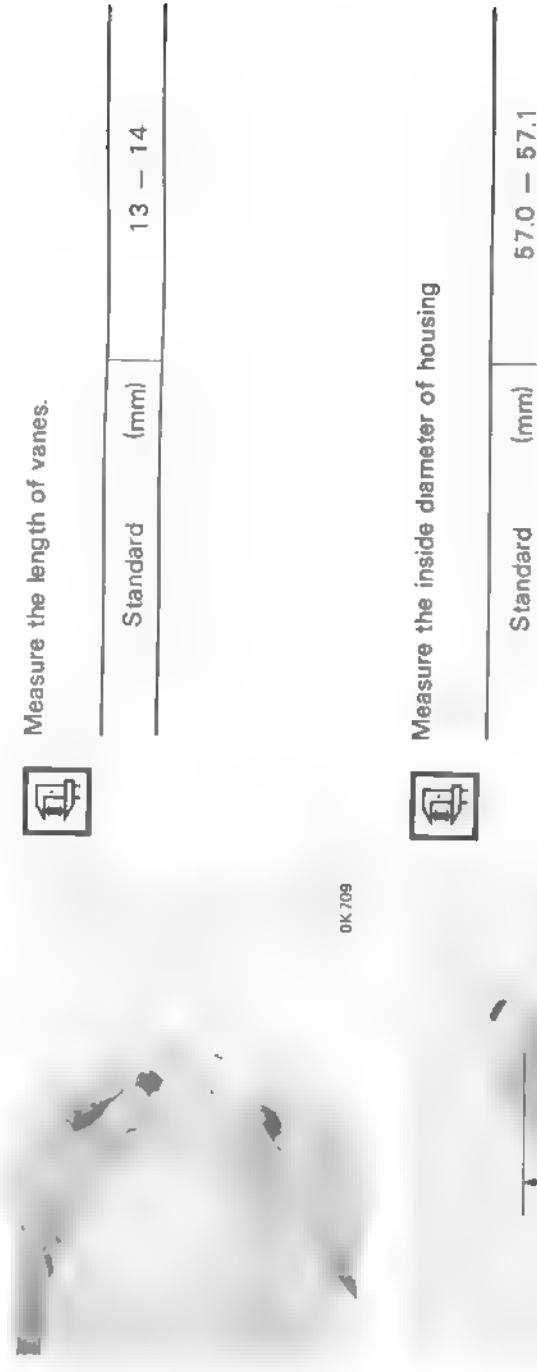
“QUALITY PARTS  
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**DISASSEMBLY**
**Disassembly steps**

1. Vacuum pipe connector
2. Connecting bolt and connecting ring
3. Cover
4. Rotor assembly
5. Housing
6. Flange


**INSPECTION**

Make necessary correction or parts replacement if wear, damage or any other abnormal conditions are found through inspection

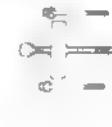
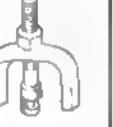


**REASSEMBLY**

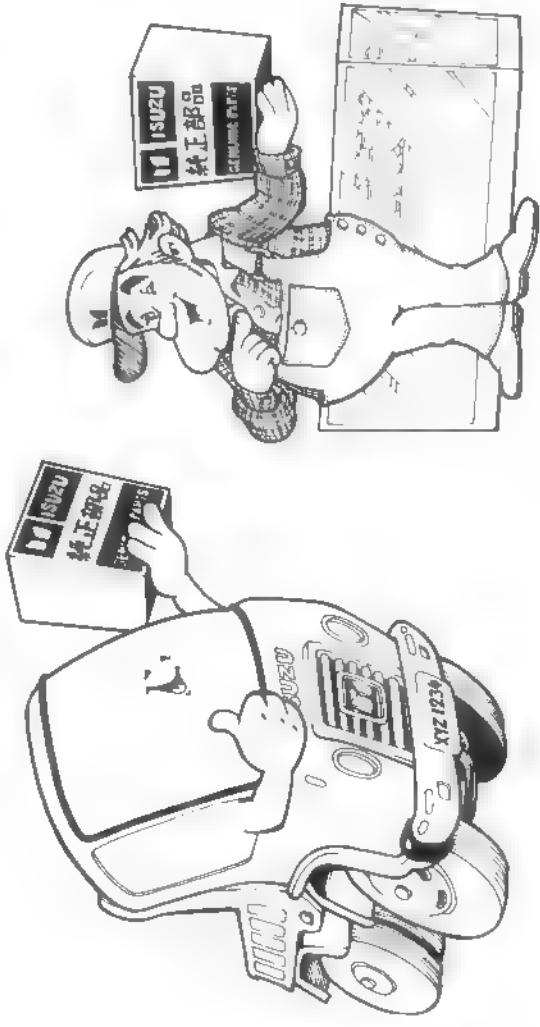
To assemble, follow the disassembly procedure in reverse order.

## SECTION 8

# SPECIAL TOOL LIST

ITEM NO.	ILLUSTRATION	PARTS NO.	PARTS NAME	PAGE
1.		5-83571-002-0	Compression gauge adaptor	1-19
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3.		9-8523-1423-0	Valve spring compressor	2-19 2-42
4.		9-8523-2552-0 (+A)	Cylinder liner remover	2-22
5.		9-8522-1148-0	Grip	2-22
6.		9-8523-2551-0	Cylinder liner installer	2-23
7.		9-8521-0074-0	Crankshaft timing gear remover	2-25
8.		9-8521-0021-0	Crankshaft timing gear installer	2-25 2-47
9.		9-8523-1812-0	Crankshaft pilot bearing remover	2-26

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## SECTION 9

# CONVERSION TABLE

### INDEX

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			PAGE
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11.		5-85230-002-0	Valve guide remover & installer 2-33
12.		9-8523-1737-0 9-8523-1360-0	Camshaft pilot bearing remover & installer 2-36
13.		5-85210-002-0	Universal puller 2-36
14.		5-85220-013-0	Crankshaft front oil seal installer 2-40

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Volume . .			9-3
Mass . . .			9-5
Pressure . .			9-6
Torque . . .			9-7
Temperature . .			9-7

INCHES TO MILLIMETERS						
	in.	in.	in.	in.	in.	in.
1	0.0394	26	1.0236	51	2.0079	76
2	0.0787	27	1.0630	52	2.0472	77
3	0.1181	28	1.1024	53	2.0866	78
4	0.1575	29	1.1417	54	2.1260	79
5	0.1969	30	1.1811	55	2.1653	80
6	0.2362	31	1.2205	56	2.2047	81
7	0.2756	32	1.2598	57	2.2441	82
8	0.3150	33	1.2992	58	2.2835	83
9	0.3543	34	1.3386	59	2.3228	84
10	0.3937	35	1.3779	60	2.3622	85
11	0.4331	36	1.4173	61	2.4016	86
12	0.4724	37	1.4567	62	2.4409	87
13	0.5118	38	1.4961	63	2.4803	88
14	0.5512	39	1.5354	64	2.5197	89
15	0.5905	40	1.5748	65	2.5590	90
16	0.6299	41	1.6142	66	2.5984	91
17	0.6693	42	1.6535	67	2.6378	92
18	0.7087	43	1.6929	68	2.6772	93
19	0.7480	44	1.7323	69	2.7165	94
20	0.7874	45	1.7716	70	2.7559	95
21	0.8268	46	1.8110	71	2.7953	96
22	0.8661	47	1.8504	72	2.8346	97
23	0.9055	48	1.8898	73	2.8740	98
24	0.9449	49	1.9291	74	2.9134	99
25	0.9842	50	1.9685	75	2.9527	100

### LENGTH

MILLIMETERS TO INCHES						
	mm	mm	mm	mm	in.	in.
1	0.0394	26	1.0236	51	0.0079	76
2	0.0787	27	1.0630	52	0.0472	77
3	0.1181	28	1.1024	53	0.0866	78
4	0.1575	29	1.1417	54	0.1260	79
5	0.1969	30	1.1811	55	0.1653	80
6	0.2362	31	1.2205	56	0.2047	81
7	0.2756	32	1.2598	57	0.2441	82
8	0.3150	33	1.2992	58	0.2835	83
9	0.3543	34	1.3386	59	0.3228	84
10	0.3937	35	1.3779	60	0.3622	85
11	0.4331	36	1.4173	61	0.4016	86
12	0.4724	37	1.4567	62	0.4409	87
13	0.5118	38	1.4961	63	0.4803	88
14	0.5512	39	1.5354	64	0.5197	89
15	0.5905	40	1.5748	65	0.5590	90
16	0.6299	41	1.6142	66	0.5984	91
17	0.6693	42	1.6535	67	0.6378	92
18	0.7087	43	1.6929	68	0.6772	93
19	0.7480	44	1.7323	69	0.7165	94
20	0.7874	45	1.7716	70	0.7559	95
21	0.8268	46	1.8110	71	0.7953	96
22	0.8661	47	1.8504	72	0.8346	97
23	0.9055	48	1.8898	73	0.8740	98
24	0.9449	49	1.9291	74	0.9134	99
25	0.9842	50	1.9685	75	0.9527	100

INCHES TO MILLIMETERS						
	in.	in.	in.	in.	mm	mm
1	0.0394	26	1.0236	51	2.0079	76
2	0.0787	27	1.0630	52	2.0472	77
3	0.1181	28	1.1024	53	2.0866	78
4	0.1575	29	1.1417	54	2.1260	79
5	0.1969	30	1.1811	55	2.1653	80
6	0.2362	31	1.2205	56	2.2047	81
7	0.2756	32	1.2598	57	2.2441	82
8	0.3150	33	1.2992	58	2.2835	83
9	0.3543	34	1.3386	59	2.3228	84
10	0.3937	35	1.3779	60	2.3622	85
11	0.4331	36	1.4173	61	2.4016	86
12	0.4724	37	1.4567	62	2.4409	87
13	0.5118	38	1.4961	63	2.4803	88
14	0.5512	39	1.5354	64	2.5197	89
15	0.5905	40	1.5748	65	2.5590	90
16	0.6299	41	1.6142	66	2.5984	91
17	0.6693	42	1.6535	67	2.6378	92
18	0.7087	43	1.6929	68	2.6772	93
19	0.7480	44	1.7323	69	2.7165	94
20	0.7874	45	1.7716	70	2.7559	95
21	0.8268	46	1.8110	71	2.7953	96
22	0.8661	47	1.8504	72	2.8346	97
23	0.9055	48	1.8898	73	2.8740	98
24	0.9449	49	1.9291	74	2.9134	99
25	0.9842	50	1.9685	75	2.9527	100

### LENGTH

## FEET TO METERS

## AREA

ft.	0	1	2	3	4	5	6	7	8	9	ft.
m	0	m	m	m	m	m	m	m	m	m	m
-	0.305	0.610	0.914	1.219	1.524	1.829	2.134	2.438	2.743	-	-
10	3.048	3.353	3.658	3.962	4.267	4.572	4.877	5.182	5.486	5.791	10
20	6.096	6.401	6.706	7.010	7.315	7.620	7.925	8.230	8.534	8.839	20
30	9.144	9.449	9.754	10.058	10.363	10.668	10.973	11.278	11.582	11.887	30
40	12.192	12.497	12.802	13.106	13.411	13.716	14.021	14.326	14.630	14.935	40
50	15.240	15.545	15.850	16.154	16.459	16.764	17.069	17.374	17.678	17.983	50
60	18.288	18.593	18.898	19.202	19.507	19.812	20.117	20.422	20.726	21.031	60
70	21.336	21.641	21.946	22.250	22.555	22.860	23.165	23.470	23.774	24.079	70
80	24.384	24.689	24.994	25.298	25.598	25.898	26.213	26.518	26.822	27.127	80
90	27.432	27.737	28.042	28.346	28.651	28.956	29.261	29.566	29.870	30.175	90
100	30.480	30.785	31.090	31.394	31.699	32.004	32.309	32.614	32.918	33.223	100

## METERS TO FEET

miles	0	1	2	3	4	5	6	7	8	9	miles
km	0	km	km								
-	1.609	17.703	32.219	48.288	64.437	80.447	96.666	112.265	128.755	144.484	-
10	16.093	33.796	50.406	67.593	84.294	101.08	118.102	135.911	152.720	170.529	10
20	32.187	68.897	104.986	140.267	176.548	212.829	249.102	285.381	321.659	357.938	20
30	48.280	49.890	51.499	53.108	54.718	56.327	57.936	59.546	61.155	62.764	30
40	64.374	65.983	67.593	69.202	70.811	72.421	74.030	75.639	77.249	78.858	40
50	80.467	82.077	83.686	85.295	86.905	88.514	90.123	91.733	93.342	94.951	50
60	96.561	98.170	99.779	101.390	103.000	104.610	106.220	107.830	109.440	111.040	60
70	112.650	114.260	115.870	117.480	119.090	120.700	122.310	123.920	125.530	127.140	70
80	128.750	130.360	131.970	133.580	135.190	136.790	138.400	140.010	141.620	143.230	80
90	144.840	146.450	148.060	149.670	151.280	152.890	154.500	156.110	157.720	159.330	90
100	160.930	162.540	164.150	165.760	167.370	168.980	170.590	172.200	173.810	175.420	100

## SQUARE INCHES TO SQUARE CENTIMETERS

in <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	in <sup>2</sup>
cm <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	cm <sup>2</sup>
-	6.452	12.903	19.355	25.806	32.258	38.710	45.161	51.613	58.064	-	-
10	64.516	70.968	77.419	83.871	90.322	96.774	103.226	109.677	116.129	122.580	10
20	129.032	135.484	141.935	148.387	154.838	161.290	167.742	174.193	180.645	187.096	20
30	193.548	200.000	206.451	212.903	219.354	225.806	232.258	238.709	245.161	251.612	30
40	258.064	264.516	270.967	277.419	283.870	290.322	296.774	303.225	309.677	316.128	40
50	322.580	329.032	335.483	341.935	348.386	354.838	361.290	367.741	374.193	380.644	50
60	387.096	393.548	399.999	406.451	412.902	419.354	425.806	432.258	438.709	445.160	60
70	451.612	458.064	464.515	470.967	477.418	483.870	490.322	496.773	503.225	509.676	70
80	516.128	522.580	529.031	535.483	541.934	548.386	554.838	561.289	567.741	574.192	80
90	580.644	587.098	593.547	599.999	606.450	612.902	619.354	625.805	632.257	638.708	90
100	645.160	651.612	658.063	664.515	670.966	677.418	683.870	690.321	696.773	703.224	100

## SQUARE CENTIMETERS TO SQUARE INCHES

cm <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	cm <sup>2</sup>
in <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	in <sup>2</sup>
-	0.155	0.310	0.465	0.620	0.775	0.930	1.085	1.240	1.395	-	-
10	1.550	1.705	1.860	2.015	2.170	2.325	2.480	2.635	2.790	2.945	10
20	3.100	3.255	3.410	3.565	3.720	3.875	4.030	4.185	4.340	4.495	20
30	4.650	4.805	4.960	5.115	5.270	5.425	5.580	5.735	5.890	6.045	30
40	6.200	6.355	6.510	6.665	6.820	6.975	7.130	7.285	7.440	7.595	40
50	7.750	7.905	8.060	8.215	8.370	8.525	8.680	8.835	8.990	9.145	50
60	9.300	9.455	9.610	9.765	9.920	10.075	10.230	10.385	10.540	10.695	60
70	10.850	11.005	11.160	11.316	11.470	11.625	11.780	11.935	12.090	12.245	70
80	12.400										

U.S. gall.	0	1	2	3	4	5	6	7	8	9	U.S. gall.
liters	liters	liters	liters	liters	liters	liters	liters	liters	liters	liters	liters
10	37.8543	37.854	7.5709	11.3563	15.1417	18.9271	22.7126	26.4980	30.2834	34.0638	-
20	75.7085	79.4940	83.2794	87.0648	90.8502	94.6357	98.4211	102.2065	105.9920	109.7774	20
30	113.5628	117.3482	121.1337	124.9191	128.7045	132.4899	136.2754	140.0608	143.8462	147.6316	30
40	151.4171	165.2025	168.9779	172.7734	176.5588	180.3442	184.1296	187.9151	191.7005	195.4859	40
50	189.2713	193.0568	196.8422	200.6278	204.4131	210.1985	211.9839	215.7693	223.3402	253.6236	50
60	227.1256	230.9110	234.6965	238.4819	242.2673	246.0527	249.8382	257.4090	261.1945	30.13608	60
70	264.9799	268.7653	272.5507	276.3362	280.1216	283.9070	287.6924	294.4779	295.2633	299.0487	70
80	302.8342	306.6196	310.4050	314.1904	317.9759	321.7613	325.5467	328.3321	333.1176	336.9030	80
90	340.6884	344.4738	348.2593	352.0447	355.8301	359.6156	363.4010	367.1864	370.9718	374.7573	90
100	378.5427	382.3281	386.1135	389.8990	393.6844	397.4698	401.2563	405.0407	408.8261	412.6115	100

## LITERS TO GALLONS (U. S.)

liters	0	1	2	3	4	5	6	7	8	9	liters
gal.	gal.	gal.	gal.	gal.	gal.	gal.	gal.	gal.	gal.	gal.	gal.
-	0.2642	0.5283	0.7926	1.0567	1.3209	1.5850	1.8492	2.1134	2.3775	-	-
10	2.6417	2.9059	3.1701	3.4342	3.6984	3.9626	4.2267	4.4909	4.7551	5.0192	10
20	5.2834	5.5476	5.8118	6.0759	6.3401	6.6043	6.8684	7.1326	7.3968	7.6610	20
30	7.9251	8.1893	8.4535	8.7176	8.9818	9.2460	9.5102	9.7743	10.0385	10.3027	30
40	10.5668	11.0952	11.5394	11.8877	12.1519	12.4160	12.6802	12.9444	13.2085	13.4727	40
50	13.2086	13.4727	13.7369	14.0011	14.2652	14.5294	14.7936	15.0577	15.3219	15.5861	50
60	15.8503	16.1144	16.3786	16.6428	16.9069	17.1711	17.4353	17.6995	17.9636	18.2278	60
70	18.4920	18.7561	19.0203	19.2845	19.5487	19.8128	20.0770	20.3412	20.6053	20.8695	70
80	21.3979	21.6620	22.1904	22.4545	22.7187	22.9829	23.2470	23.5112	23.7754	24.0496	80
90	23.7754	24.0396	24.3037	24.5679	24.8321	25.0962	25.3604	25.6246	25.8888	26.1529	90
100	26.4171	26.6813	26.9454	27.2098	27.4738	27.7380	28.0021	28.2663	28.5305	28.7946	100

## KILOGRAMS TO POUNDS

liters	0	1	2	3	4	5	6	7	8	9	liters
kg											
-	0.454	0.907	1.361	1.814	2.268	2.722	3.175	3.629	4.082	-	-
10	4.536	4.990	5.443	5.897	6.350	6.804	7.257	7.711	8.165	8.618	10
20	9.072	9.525	9.979	10.433	10.886	11.340	11.793	12.247	12.701	13.154	20
30	13.608	14.061	14.516	14.969	15.422	15.876	16.329	16.783	17.237	17.690	30
40	18.144	18.597	19.051	19.504	19.958	20.412	20.865	21.319	21.772	22.226	40
50	22.680	23.133	23.587	24.040	24.494	24.948	25.401	25.855	26.308	26.762	50
60	27.216	27.669	28.123	28.576	29.030	29.484	29.937	30.391	30.844	31.298	60
70	31.751	32.205	32.659	33.112	33.566	34.019	34.473	34.927	35.380	35.834	70
80	36.287	36.741	37.195	37.648	38.102	38.555	39.009	39.463	39.916	40.370	80
90	40.823	41.277	41.730	42.184	42.638	43.092	43.545	43.998	44.453	44.906	90
100	45.359	45.813	46.266	46.720	47.174	47.627	48.081	48.534	48.988	49.442	100

## GALLONS (IMP.) TO LITERS

Imp. gal.	0	1	2	3	4	5	6	7	8	9	Imp. gal.
liters	liters	liters	liters	liters	liters	liters	liters	liters	liters	liters	liters
-	4.546	5.097	5.643	6.189	6.735	7.281	7.827	8.373	8.919	-	-
10	45.4596	50.0066	54.5515	59.0975	63.6434	68.1894	72.2354	77.4749	82.7285	88.1326	-
20	90.9192	95.4652	100.0111	104.5571	109.1030	113.6490	118.1950	122.7409	127.2869	131.8328	20
30	136.3788	140.9248	145.4707	150.0167	154.5628	159.1086	163.6546	168.0005	172.4765	177.2924	30
40	181.8384	186.3844	190.9303	195.4763	200.0222	204.5682	209.1142	213.6601	218.2081	222.520	40
50	227.2980	231.8440	236.3899	240.9359	245.4818	250.0278	254.5738	259.1197	263.6557	268.2116	50
60	272.7576	277.3036	281.8495	286.3955	290.9414	295.4874	300.0334	304.5793	309.1253	313.6712	

## POUNDS PER SQUARE INCHES TO KILOGRAMS PER SQUARE CENTIMETERS

kg/cm <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	kg/cm <sup>2</sup>
10	0.7031	0.7033	0.7103	0.7146	0.7210	0.7281	0.7351	0.7421	0.7491	0.7553	0.7625
20	1.4062	1.4765	1.5468	1.6171	1.6874	1.7577	1.8280	1.8983	1.9686	2.0389	2.1082
30	2.1092	2.1795	2.2498	2.3202	2.3905	2.4608	2.5311	2.6014	2.6717	2.7420	2.8123
40	2.8123	2.8826	2.9529	3.0232	3.0935	3.1639	3.2342	3.3045	3.3748	3.4451	3.5154
50	3.5154	3.5857	3.6560	3.7263	3.7966	3.8669	3.9372	4.0072	4.0779	4.1482	4.2185
60	4.2185	4.2886	4.3591	4.4294	4.4997	4.5700	4.6403	4.7106	4.7809	4.8512	4.9216
70	4.9216	4.9919	5.0622	5.1325	5.2028	5.2731	5.3434	5.4137	5.4840	5.5543	5.6246
80	5.6246	5.6946	5.7652	5.8356	5.9059	5.9762	6.0465	6.1168	6.1871	6.2574	6.3277
90	6.3277	6.3980	6.4683	6.5386	6.6089	6.6793	6.7496	6.8199	6.8902	6.9605	7.0308
100	7.0308	7.1011	7.1714	7.2417	7.3120	7.3823	7.4526	7.5229	7.5933	7.6636	7.7323

## FOOT POUNDS TO KILOGRAMMETERS

kg/m <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	kg/m <sup>2</sup>
10	0.7031	0.7734	0.8437	0.9140	0.9843	1.0546	1.1249	1.1952	1.2655	1.3358	1.4051
20	1.4062	1.4765	1.5468	1.6171	1.6874	1.7577	1.8280	1.8983	1.9686	2.0389	2.1082
30	2.1092	2.1795	2.2498	2.3202	2.3905	2.4608	2.5311	2.6014	2.6717	2.7420	2.8123
40	2.8123	2.8826	2.9529	3.0232	3.0935	3.1639	3.2342	3.3045	3.3748	3.4451	3.5154
50	3.5154	3.5857	3.6560	3.7263	3.7966	3.8669	3.9372	4.0072	4.0779	4.1482	4.2185
60	4.2185	4.2886	4.3591	4.4294	4.4997	4.5700	4.6403	4.7106	4.7809	4.8512	4.9216
70	4.9216	4.9919	5.0622	5.1325	5.2028	5.2731	5.3434	5.4137	5.4840	5.5543	5.6246
80	5.6246	5.6946	5.7652	5.8356	5.9059	5.9762	6.0465	6.1168	6.1871	6.2574	6.3277
90	6.3277	6.3980	6.4683	6.5386	6.6089	6.6793	6.7496	6.8199	6.8902	6.9605	7.0308
100	7.0308	7.1011	7.1714	7.2417	7.3120	7.3823	7.4526	7.5229	7.5933	7.6636	7.7323

## KILOGRAMS PER SQUARE CENTIMETERS TO POUNDS PER SQUARE INCHES

kg/cm <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	kg/cm <sup>2</sup>
10	14.22	28.45	42.67	56.89	71.12	85.34	99.56	113.78	128.01	142.23	156.45
20	284.46	570.68	849.0	1199.12	1499.12	213.35	227.57	241.79	256.02	270.24	270.24
30	426.70	440.92	455.14	469.36	483.59	511.36	535.58	569.80	584.03	604.27	619.10
40	568.93	683.15	697.37	711.60	725.82	640.04	654.27	668.49	682.71	706.94	706.94
50	711.16	725.38	739.61	753.83	768.05	782.28	796.50	810.72	824.94	839.17	839.17
60	853.39	867.61	881.84	896.06	910.28	924.51	938.73	952.95	967.18	981.40	981.40
70	995.62	1009.80	1024.10	1038.30	1052.50	1066.70	1081.00	1095.20	1109.40	1123.60	1123.60
80	1137.80	1152.10	1166.30	1180.50	1194.70	1209.00	1223.20	1237.40	1251.60	1265.90	1265.90
90	1280.10	1294.30	1308.50	1322.70	1337.00	1351.20	1365.40	1379.60	1393.90	1408.10	1408.10
100	1422.30	1436.50	1450.80	1465.00	1479.20	1493.40	1507.70	1521.90	1536.10	1550.30	1550.30

## KILOGRAMS TO FOOT POUNDS

kg-m	0	1	2	3	4	5	6	7	8	9	kg-m
10	1.382	2.152	2.902	3.652	4.402	5.152	5.902	6.652	7.402	8.152	8.902
20	2.764	3.516	4.264	5.016	5.764	6.516	7.264	8.016	8.764	9.516	10.264
30	4.146	4.896	5.646	6.396	7.146	7.896	8.646	9.396	10.146	10.896	11.646
40	5.528	6.278	7.028	7.778	8.528	9.278	10.028	10.778	11.528	12.278	13.028
50	6.910	7.660	8.410	9.160	9.910	10.660	11.410	12.160	12.910	13.660	14.410
60	8.292	8.942	9.692	10.442	11.192	11.942	12.692	13.442	14.192	14.942	15.692
70	9.674	9.812	9.950	10.088	10.227	10.365	10.503	10.641	10.779	10.918	11.056
80	11.056	11.194	11.332	11.470	11.609	11.747	11.885	12.023	12.161	12.300	12.438
90	12.438	12.576	12.714	12.852	12.990	13.129	13.267	13.405	13.544	13.682	13.820
100	13.820	13.958	14.096	14.235	14.373	14.511	14.649	14.787	14.925	14.064	14.205

## KILOGRAMS PER SQUARE CENTIMETERS TO KILO PASCAL

kg/cm <sup>2</sup>	0	1	2	3	4	5	6	7	8	9	kg/cm <sup>2</sup>
10	98.1	196.1	294.2	392.3	490.3	588.4	686.5	784.5	882.6	980.7	1078.7
20</td											

**1924-WE-101**

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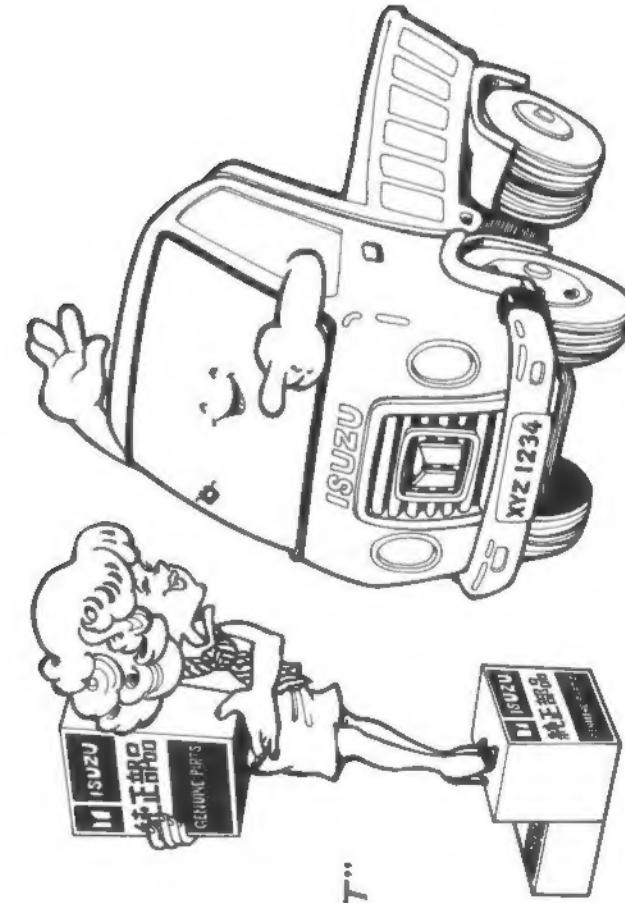
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